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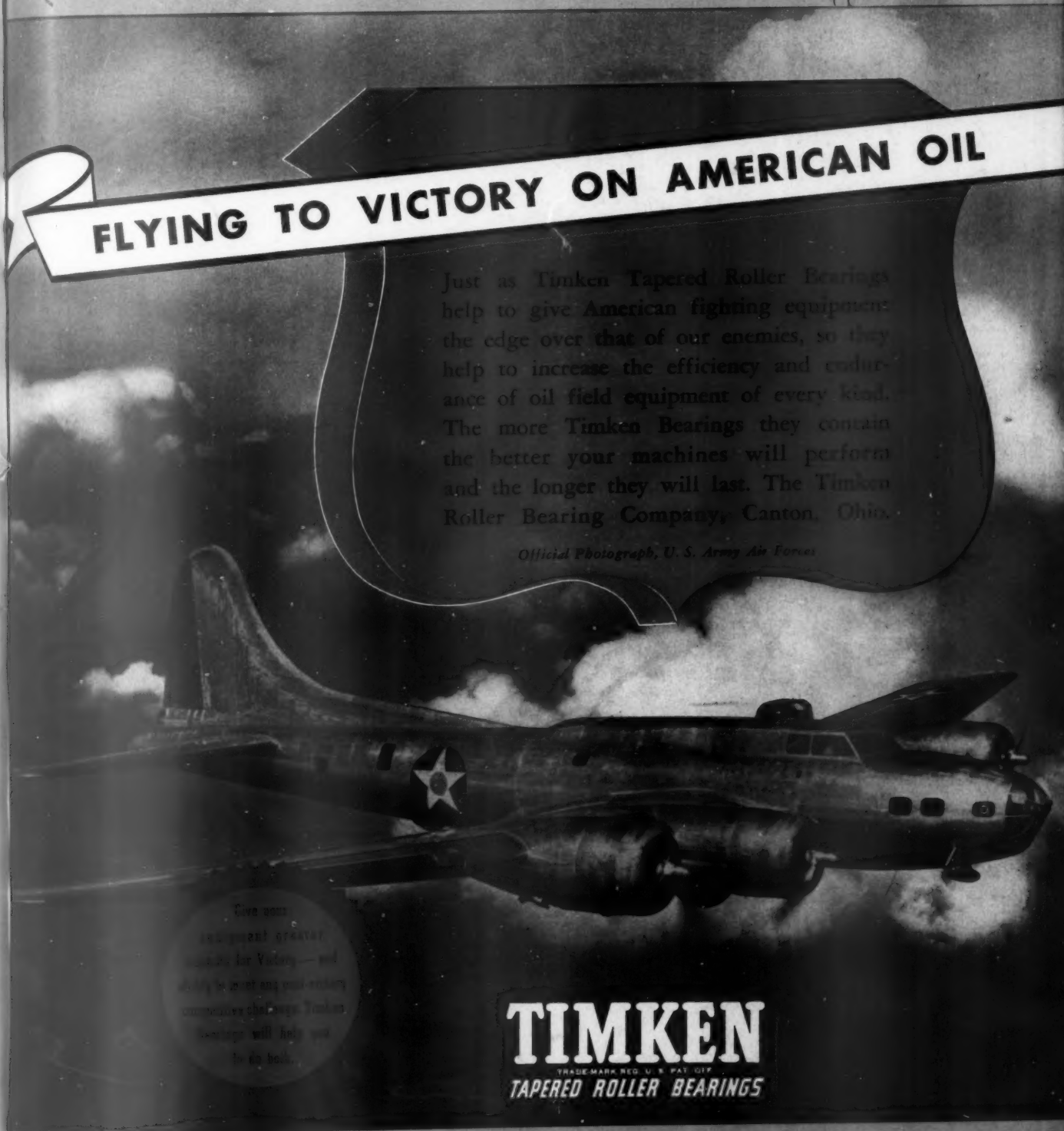
The OIL AND GAS JOURNAL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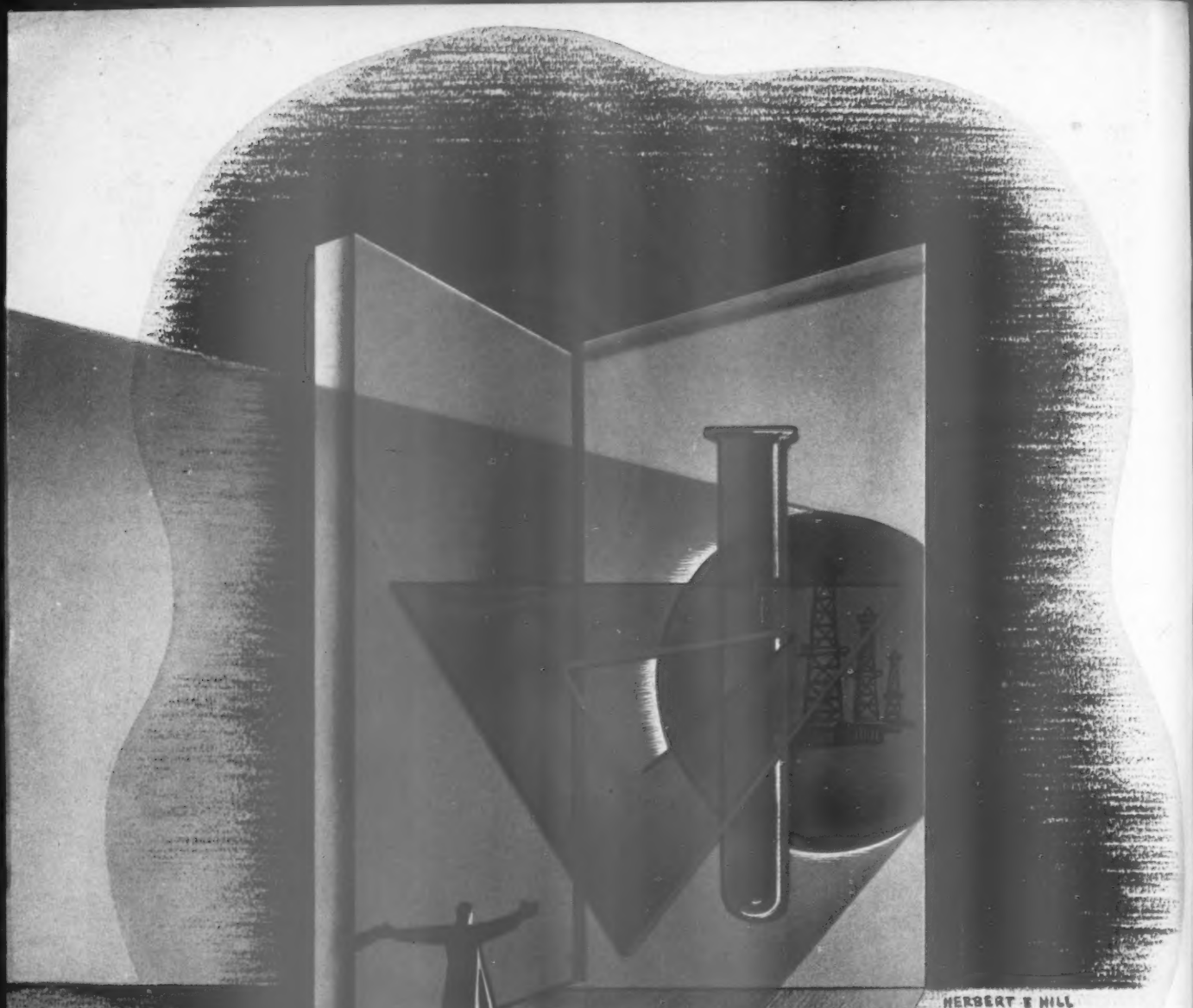

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the OIL AND GAS JOURNAL

published weekly by the

PETROLEUM PUBLISHING COMPANY

211 S. CHEYENNE ST., TULSA, OKLAHOMA

Subscription price, United States and foreign, 1 year, $6.00; 2 years, $10.00; 3 years, $12.00; 5 years, $15.00. Single copies, 20 cents. Back copies, when over a year old, 50 cents. Entered as second-class mail matter at Tulsa, Okla., under Act of March 3, 1879.

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Vol. 42, No. 7 June 24, 1943

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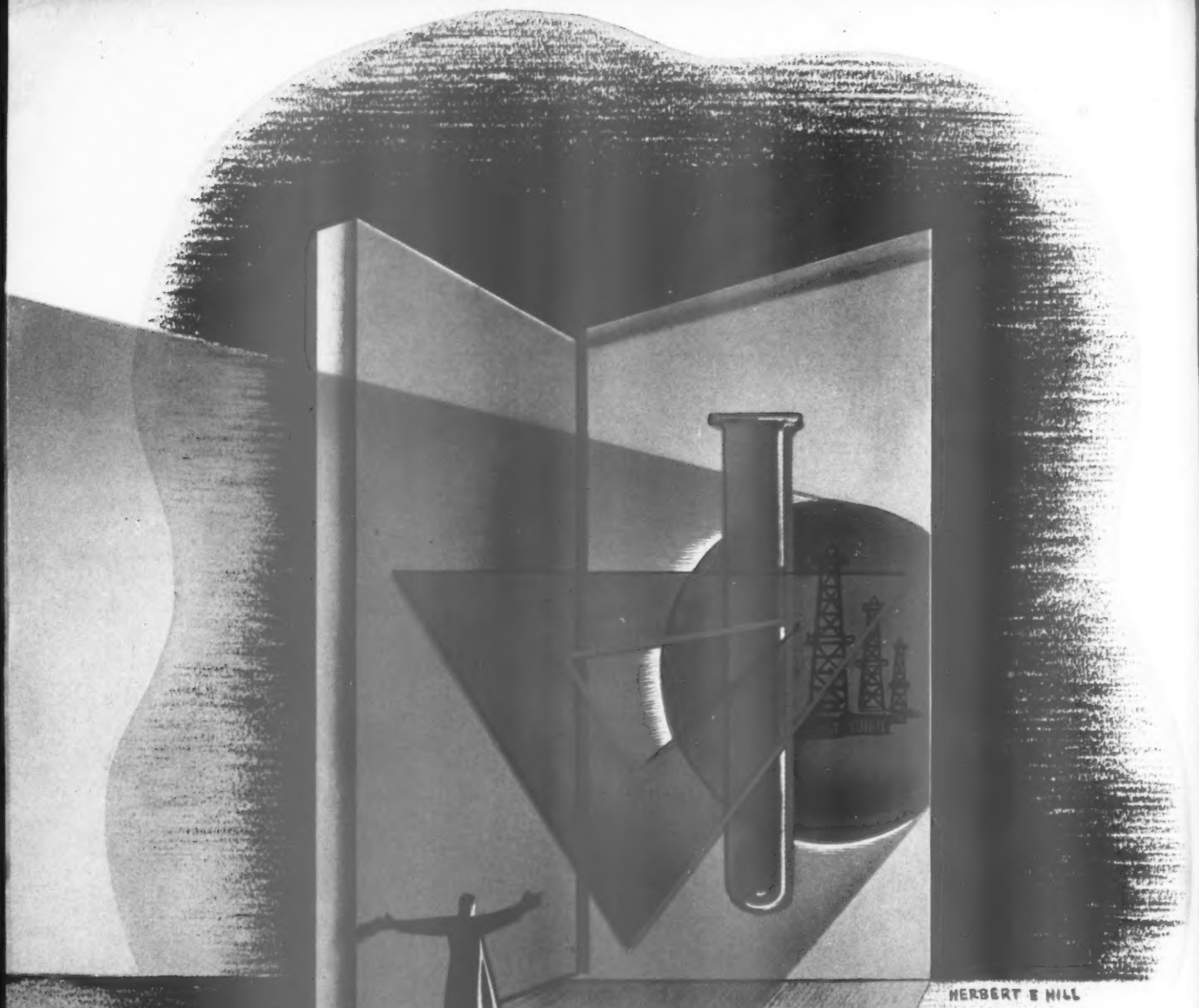

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SEISMOGRAPH SURVEYS

BRANCH OFFICE: HOUSTON, TEXAS

DALLAS, TEXAS

the OIL AND GAS JOURNAL

Trends

Crude-Oil Production By States—Page 159

CRUDE PRODUCTION 3,990,605 bbl. daily average—up 19,385 bbl. One year ago 3,743,060 bbl.

CRUDE STOCKS 244,720,000 bbl. as of June 12—down 387,000 bbl. One year ago 253,386,000 bbl.

GASOLINE STOCKS 81,114,000 bbl. as of June 12—down 1,091,000 bbl. One year ago 91,846,000 bbl.

RESIDUAL FUEL-OIL STOCKS 67,652,000 bbl. as of June 12—up 442,000. One year ago 79,120,000 bbl.

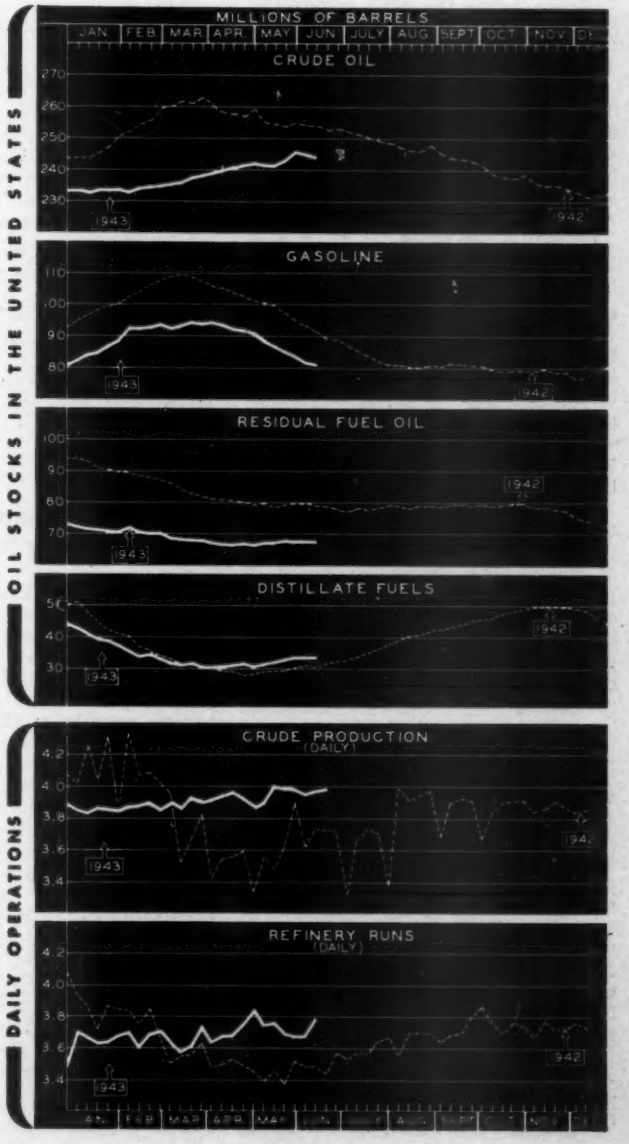
GAS OIL AND DISTILLATES 32,555,000 bbl. as of June 12—down 22,000. One year ago 30,447,000 bbl.

REFINERY RUNS 3,799,000 bbl. daily week ended June 12—up 137,000. One year ago 3,494,000 bbl.

ECONOMISTS of the industry were pointing out the first of the week that the increased production of crude oil authorized by PAW for July is not a solution to the shortages in civilian petroleum supplies which this month have been receiving attention in all parts of the country. In authorizing an increase in July over June, PAW officials made it clear that the increase was to be used to furnish additional supplies for the War Emergency pipe line and refineries which are producing war products. Practically all of the increase will be in Texas fields with the enlarged production to be delivered to the 24-in. line at Longview and several refineries making war products in the Gulf Coast.

IT is pointed out that this program does not provide additional crude for Mid-Continent and Middle West refineries which in many instances have been feeling the pinch of decreased supplies and greater demands for several weeks. In District 2 (middle western states, Oklahoma, Kentucky and Kansas) the certified production for July is 24,000 bbl. daily less than in June. The decrease reflects the fact that in May and so far in June production has been less than the allowables and in some instances state agencies informed the Washington officials early this month that further declines were in prospect for July. The declines center in Oklahoma with a 12,000-bbl. daily decline for July and Illinois whose authorized production next month will be 13,200-bbl. daily under June. Indiana and Ohio output will decrease.

IT is agreed that these crude-oil allowables for District 2 in July will be substantially under the refinery demands. Refiners and marketers in recent weeks have discussed possible methods of adding to the crude-oil supplies by increasing importations from Texas. It is understood that changes to be made in the pipe-line movement of crude oil will result in a small increase in shipments from Texas. These increases are not sufficient to take care of the demands within the district and the required shipments to District 1. It is said that PAW officials have not looked with favor on the suggestion that more tank cars be used in the movement of crude oil from Texas fields to District 2 refineries. This program would involve subsidy payments to cover the higher costs of the tank-car movements. New lines north out of Texas are being discussed and one 16-in. line has been authorized to Drumright, Okla., but these projects do not offer any relief until next year.



Producing Capacity Disappearing

Immediate Remedial Action on Prices Is Needed to Complement Other Corrective Steps and Avert Imminent Oil Shortage

by Henry D. Ralph

WASHINGTON, D. C.—Excess productive capacity with which the oil industry entered the war will have disappeared entirely by the end of this year unless practical remedial action is taken immediately. Thus, Petroleum Administrator Ickes warned Prentiss A. Brown, price administrator, of an imminent supply shortage in renewing his request for an immediate increase in the price of crude.

Mr. Ickes, in a 2,000-word letter dated June 10 but made public here only this week, assailed several points in Price Administrator Brown's letter of May 1 rejecting the original recommendation for an oil-price advance filed with OPA April 7.

"A prospective crude-oil shortage impends," Mr. Ickes said. "I would be doing less than my clear duty now if I did not urge and reurge that not only some but all possible steps, including the price adjustments which I have recommended, be taken to minimize those dangers and those hardships which a severe shortage of oil and its necessarily more stringent civilian rationing are bound to impose."

Mr. Ickes told Mr. Brown that "although I note with satisfaction that we seem to agree on the importance of maintaining adequate reserves of petroleum, apparently I did not stress sufficiently either the imminence of a shortage in our daily productive capacity or the practical urgency of a price increase if the risks of such a shortage are to be minimized."

Brown's Objections Attacked

Taking up Mr. Brown's objections and alternatives to a price increase, Administrator Ickes said, in part:

"It is no answer to an imminent shortage to say that the rate of exploratory drilling is now approximately the same as last year when neither that rate nor the rates prevailing since 1938 have led to sufficient discoveries to replace what we have consumed. This decrease in discoveries is of far greater import than that of a mere loss in total reserves. It is from new fields and fields only a few years old that we procure flush production. It is upon flush production that we have always depended for over half of our current production. A shortage of crude oil occurs when demands exceed current productive capacities—it cannot be postponed by statistical calculations of theoretical reserves producible over half a century.

"Had we not been fortunate enough to enter this war with a large excess of daily capacity to produce from flush fields developed in the thirties, we would have been compelled to pay more for crude oil long before now. But now this excess capacity is virtually gone, and will have disappeared entirely by the end of this year unless practical remedial action is taken immediately."

Taking up Mr. Brown's statement that there are other factors than price which have a bearing on the problem of crude supply, Mr. Ickes outlined what has been done in regard to manpower, spacing restrictions, and drilling materials, and declared that since price is admittedly one important factor it should be used along with other means of increasing production.

He cited the example of California where drilling increased 52 per cent immediately after the price was increased and spacing restrictions relaxed.

Mr. Ickes also criticized Brown's statement that a general increase is not justified on the basis of increased costs, contending that the Tariff Commission survey included only such exploratory outlays as companies with production elected to charge against that production.

Independents Liquidating

While integrated companies may feel compelled to explore or buy proven properties, Mr. Ickes said this does not apply to independent producers who are now impelled to liquidate rather than expand. He said "hundreds of experienced and skillful independent oil producers have in fact already withdrawn from oil activities to devote themselves to more profitable farming and ranching. These are the men who have discovered one-half to two-thirds of our total number of oil fields. As such, the independent producer is critically important."

The subsidy plan proposed by Mr. Brown was ridiculed by the oil administrator who concluded: "I do not believe that any complicated patchwork of subsidies extending from exploration to stripper wells to marginal drilling and secondary recovery can possibly be drafted, introduced, financed, and administered with sufficient speed and adequate safeguards to minimize, in any substantial degree, the effects of the shortage we face."

He said the cost and complexities of administration would be staggering and the Government would have to hire most of the industry's technologists who ought to be finding oil. If each subsidy is based on careful study, its results will be too slow to do any good, Mr. Ickes said, while if subsidies are lavish the plan will be a promoter's paradise and drilling dry holes will be profitable.

"No historical ratio of producers to dry holes will hold since the Govern-

Complete Solution Promised by Nelson

WASHINGTON, D. C. — A complete solution of the petroleum-supply problem on the Atlantic seaboard was promised in the very near future by WPB Chairman Donald M. Nelson appearing Monday before the unofficial House committee of East Coast congressmen.

In reply to a question from Chairman Hartley if it would not be advisable to put complete control in PAW, Mr. Nelson said that this is not practical because of the overlapping functions of various war agencies but that a plan is being perfected to get complete coordination of PAW, OPA and ODT. Mr Nelson said he could promise relief this time where this was not possible before, but did not disclose the nature of the plan.

ment inevitably will be asked to risk its funds on the lemons, not the plums. Indeed, in the end the Government would be able to liquidate its investment only by permitting a rise in crude-oil prices sufficient to permit a few of its successful projects to pay off its losses on innumerable purely promotional ventures," Mr. Ickes said, describing the subsidy idea as a search for a system of economic perpetual motion.

Turning to OPA's inflationary argument, Mr. Ickes asserted that windfalls of excess purchasing power resulting from a crude-price increase would be no greater than those which certain promoters would get under a subsidy plan. An increase in the price of that gasoline still being used for nonessential purposes can hardly be called inflationary and under rationing consumers are spending less for gasoline than ever before, he said, and fuel-oil prices ought to be such as to encourage conversion to coal.

Texas Assigned Bulk of Production Increase Certified for July

WASHINGTON, D. C.—An increase of 109,600 bbl. in the daily production quota for crude oil and other liquid petroleum in July was assigned last week by the Petroleum Administration for War, lifting the recommended output to 4,328,500 bbl.

Rates of production assigned to the eastern, Rocky Mountain and Pacific Coast states, Districts 1, 4, and 5, were substantially unchanged from the preceding month. Production rates certified from the Middle West, District 2, were generally reduced to conform with the continued declining productive capacity in that area. The production rates certified to District 3 states were increased 129,900 bbl. per day with Texas receiving 125,000 bbl. of the total upward adjustment.

Certified Production Rates of All Petroleum Liquids
(Barrels per day)

	July	June
District 1:		
New York	15,000	15,000
Pennsylvania	46,800	48,000
West Virginia	16,500	15,000
Total	78,300	78,000
District 2:		
Illinois	233,000	246,200
Indiana	14,500	15,500
Kansas	300,000	300,000
Kentucky	25,000	23,100
Michigan	60,100	58,900
Nebraska	2,200	2,400
Ohio	9,800	10,400
Oklahoma	361,400	373,500
Total	1,006,000	1,030,000
District 3:		
Arkansas	77,200	72,800
Louisiana	331,300	330,800
Mississippi	50,000	50,000
New Mexico	105,700	105,700
Texas	1,727,000	1,602,000
Total	2,291,200	2,161,300
District 4:		
Colorado	7,000	7,000
Montana	21,800	22,300
Wyoming	97,200	97,000
Total	126,000	126,300
District 5:		
California	827,000	823,300
Total United States	4,328,500	4,218,900

"The major portion of the increased production rate certified for District 3 is confined to Texas," declared Ralph K. Davies, deputy administrator, "because this is the only oil-producing state where quantity and quality of crude oil required to meet the demand are readily available to transportation facilities.

"Scheduled operations of transportation and refining facilities throughout the nation designed to obtain maximum production of war products require that the increased production certified for July in Texas be produced from sweet-crude oil fields and be made available to the Longview terminal of the War Emergency Pipelines, Inc., and to important refining centers so that the most efficient utilization of existing installations can be realized."

The certified rate of 4,328,500 bbl. daily is 503,100 bbl. higher than the actual output of all petroleum liquids in July 1942.

Purchasers Post Higher Panhandle Crude Prices

AMARILLO, Tex.—Texas Co., Humble Oil & Refining Co., Phillips Petroleum Co., and Magnolia Petroleum Co., purchasers of a majority of the free crude in the Texas Panhandle, last week posted higher prices, accepting the authority granted by OPA to lift quotations 7 cents per barrel.

Magnolia's new posting starts at 98 cents for 28 to 28.9-gravity crude with a differential of 2 cents topped by $1.22 for 40 gravity and above.

The Texas Co., started its new postings at $1.10 per barrel for 34 to 34.9-gravity crude with a top price of $1.22 for 40 gravity and above. Phillips and Texas Co. adopted without modification the full range of higher prices approved by OPA which are shown in the following table:

Gravity—	Per bbl. ceiling
Below 20°	$.80
20-20.9	.82
21-21.9	.84
22-22.9	.86
23-23.9	.88
24-24.9	.90
25-25.9	.92
26-26.9	.94
27-27.9	.96
28-28.9	.98
29-29.9	1.00
30-30.9	1.02
31-31.9	1.04
32-32.9	1.06
33-33.9	1.08
34-34.9	1.10
35-35.9	1.12
36-36.9	1.14
37-37.9	1.16
38-38.9	1.18
39-39.9	1.20
40 and above	1.22

Higher postings were made effective at 7 a.m., June 16, and they apply to crudes produced in Carson, Gray, Hutchinson, Moore and Wheeler counties.

Oklahoma Protests Compressor Site On Hugoton Line

OKLAHOMA CITY, Okla.—Formal protest against proposed location of the field compressor station at Guymon, Okla., to service the projected gas line of Cities Service Transportation & Chemical Co., has been filed with the Natural Gas and Natural Gasoline Division of the Petroleum Administration for War. The objection was filed by the Oklahoma Corporation Commission, contending that another location will more equitably serve the Hugoton field.

Commissioners have been advised that the Cities Service company planned to locate the compressor station at the junction of its gathering system with the projected 240-mile 26-in. line. The tentative location, Oklahoma conservation officials argued in a message to PAW, would be detrimental to other producers in the field.

There are several unconnected wells in the field and it is the objective of the Corporation Commission to establish a market for existing producers so far as possible in order to simplify enforcement of its gas conservation order which becomes effective July 1. Walker T. Pound, conservation officer of the commission, said early this week that no protests have been filed against the gas-proration order, although it was issued a month ago. Conferences are scheduled soon between the Oklahoma and Kansas commissions seeking agreement on uniform methods of taking production potentials and methods of enforcing the ratable-taking clause.

Conflicting Trends Appear In Gasoline Consumption

SHARP disparity in motor-fuel consumption trends are reflected by the latest monthly summary of the American Petroleum Institute, covering March and the first quarter of 1943. The decline in consumption for the entire country was 15.8 per cent in March compared with the same month a year ago. Decline for the first quarter was 21.73 per cent.

The March consumption curve on motor fuel ranges from a decline of 26.9 per cent in the 17 eastern states and the District of Columbia, composing District 1 in the Petroleum Administration for War division of the country, to an increase of 11.2 per cent in District 3. Texas, with an increase of 21.1 per cent in motor-fuel consumption in March 1943 over the same month a year ago, is now the second largest consuming state in the country, topped only by California. A year ago, Texas ranked third among consuming states behind California and New York. New Mexico and Louisiana with increases of 16.8 and 10.3 per cent, respectively, are substantial contributors to the over-all increase in District 3 which also includes Alabama, down 14.6 per cent; Arkansas, off 15.5 per cent, and Mississippi, 1.2 per cent below last year's consumption.

The sustained high-consumption level in Texas as reflected by the A.P.I. figures, this week was under investigation by the Office of Price Administration, federal rationing authority, whose attention was called to this situation by an Illinois congressman. In response to the legislator's inquiry, OPA issued this statement:

"We are at a loss to know where the American Petroleum Institute could have obtained the figures quoted. This office receives copies of reports submitted by the State of Illinois and the State of Texas made to the Public Roads Administration. The tax policies of the two states are quite similar in that each refunds federal and farm gasoline tax. The change by month from the previous year (in per cent) is reported in the table below:

	Texas	Illinois
November 1942	*10.6	*1.0
December	50.0	53.4
January 1943	28.6	34.7
February	7.6	16.5
March	14.7	21.2

*Increase. All other figures decreases.

"While the difference is not nearly as great as suggested by the A.P.I. figures you will observe," OPA wrote the Illinois legislator, "that Texas is showing a lesser decline than Illinois. In part, this is due to the greater concentration of war activities in areas remote from public transportation which has occurred in Texas. This is evidenced by the fact that in the last month before rationing, November, Texas was 10.6 per cent above the previous year while Illinois was only 1 per cent above.

Some Boards Overgenerous

"We are aware," OPA continued, "of the fact that some Texas boards were originally overgenerous in the issuance of B and C rations. This happened at some points in every state and could not be prevented under our plan of rationing by neighbors. We recognize that this problem is somewhat more serious in Texas than some other places and have taken steps to have issuance there carefully reviewed so as to bring outstanding rations into line with the regulations."

Estimates of the A.P.I. cover total gasoline consumed in each state. They are based upon returns made in accordance with the provisions of the various state gasoline-tax or inspection laws and reflect "as nearly as it has been possible for us to obtain it, the total consumption of gasoline, whether taxable, subject to refund or not."

The A.P.I. statement, which accompanies its monthly summaries of estimated motor-fuel consumption, indicates that its figures are not obtained from the Public Roads Administration as are those of the OPA which doubtless accounts for the disparity between the two reporting mediums.

The increases in certain southwestern states against declines in practically all other parts of the country, according to petroleum marketing executives, are entirely a reflection of the war activity. High percentages of the Army and Navy training pro-

(Continued on Page 86)

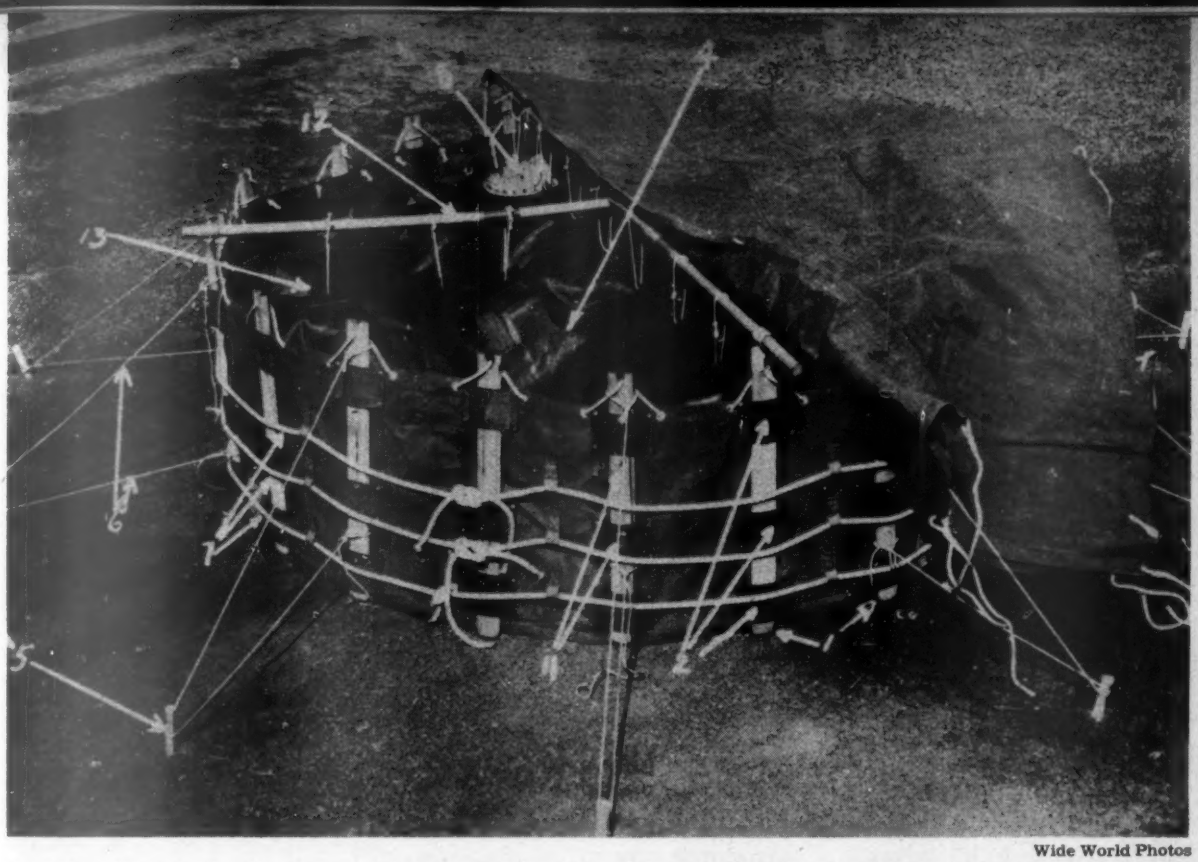
GASOLINE CONSUMPTION BY STATES

A.P.I. Estimates

(Thousands of gallons)

	March 1943	Per cent decline from March 1942
District 1—		
Connecticut	21,251	30.2
Delaware	3,831	22.8
District of Columbia	9,956	33.4
Florida	31,019	26.8
Georgia	25,172	25.8
Maine	7,868	28.5
Maryland	22,916	15.7
Massachusetts	37,297	33.9
New Hampshire	3,805	42.1
New Jersey	52,435	32.9
New York	102,396	27.0
North Carolina	33,471	17.6
Pennsylvania	91,333	26.1
Rhode Island	7,617	30.2
South Carolina	15,058	30.4
Vermont	3,235	35.6
Virginia	31,709	13.2
West Virginia	11,643	27.6
Total District 1	512,012	26.9
District 2—		
Illinois	92,646	10.1
Indiana	51,516	12.9
Iowa	32,471	34.9
Kansas	33,430	13.3
Kentucky	18,380	20.1
Michigan	76,084	19.3
Minnesota	31,717	28.7
Missouri	39,547	28.6
Nebraska	16,834	*0.6
North Dakota	8,289	37.0
Ohio	100,135	13.9
Oklahoma	30,765	11.2
South Dakota	9,266	21.4
Tennessee	27,218	*4.2
Wisconsin	36,506	19.9
Total District 2	604,804	17.0
District 3—		
Alabama	21,937	14.6
Arkansas	14,236	15.5
Louisiana	21,044	*10.3
Mississippi	19,085	1.2
New Mexico	8,498	*16.8
Texas	164,958	*21.1
Total District 3	249,758	*11.2
District 4—		
Colorado	.....	....
Idaho	6,442	13.1
Montana	7,043	21.5
Utah	8,148	*2.8
Wyoming	4,187	15.3
Total District 4	25,820	11.7
District 5—		
Arizona	9,814	6.5
California	183,605	3.2
Nevada	3,087	20.9
Oregon	20,014	21.7
Washington	31,919	13.2
Total District 5	248,439	6.7
National total	1,640,833	15.8

*Increase per cent from February.



Wide World Photos

Synthetic-rubber tents, like the one shown above, are used for storing military fuel supplies. Portability and simplicity of erection are some of the obvious military features. Final step in erection is covering the tank with a tarpaulin

THIS WEEK

PRICES—Administrator Ickes' strong rebuttal to OPA rejection of crude-price recommendation paints ominous picture. . . . Warns that excess productive capacity will disappear this year, unless IMMEDIATE remedial action is taken. . . . Alternate subsidy proposal dismissed as impractical, inoperative because technologists needed for proper administration should be out finding oil. . . . Increase of 52 per cent in California activity cited as concrete result of combination of higher prices, spacing relaxation, more accessible materials. . . . Belittles argument that exploration is at same level as last year, BECAUSE discoveries have failed to equal production for 3 years. . . . Substantial expansion dictated by conditions. . . . ¶Purchasers act promptly to post higher OPA ceilings in Texas Panhandle, up 7 cents. . . .

PRODUCTION—July quota of 4,328,500 bbl. daily, for all petroleum products, certified by PAW, up 109,600 bbl. from June, 503,100 bbl. higher than year ago. . . . Cut of 24,000 bbl. in District 2 reflects loss of productive capacity. . . . Rise of 129,900 bbl. in District 3 assigned mostly to Texas. . . . PAW specifies higher Texas quota must be sweet crude, available to WEP terminal at Longview. . . .

ADMINISTRATION—Appropriation of $5,473,000 granted PAW for fiscal year, starting July 1. . . . Original request to Budget Bureau totaled $6,990,000. . . . Cost of oil administration compares with $165,000,000 recommended for OPA; $30,685,000 for Coordinator of International Affairs; $34,472,504 for Office of War Information; $27,800,000 for censorship, as typical war-agency examples. . . .

TRANSPORTATION—Tank-car shipments approaching preflood rate, averaging 984,522 bbl. daily last week, including kerosene shipments in drums. . . . ¶Efforts continue to arrange greater capacity for Stanolind's West Texas line, to augment District 2 crude supplies. . . .

SUPPLIES—Index of East Coast stocks rises slightly, now stands at 26.8 per cent of normal. . . . ¶WPB Chairman Nelson definitely promises eastern congressmen relief, BUT declines to disclose details. . . . Hints it involves coordination of PAW, OPA, ODT. . . . ¶Converted natural-gas line, Southwest Emergency Pipe Line Co.'s project, will be unavailable for crude delivery for several months. . . . Numerous leaks require welding of all joints, other reconditioning work which may prove impractical. . . . Trial work now under way to make final determination. . . .

RATIONING—Fear of immediate tightening of rationing in Middle West subsidies. . . . Administrator Ickes reaffirms intention to cut interior supplies, WHEN transportation facilities are available for moving savings in products to East Coast. . . .

Predicate Laid for Extension of Tighter Rationing in Midwest

WASHINGTON, D. C.—The predicate for an extension of restrictions on pleasure driving and possibly a reduction in rations of semi-essential mileage was laid here last week by Petroleum Administrator Ickes who testified before an unofficial joint congressional committee.

He made no positive commitment, saying that "until the crude-oil supply problem has had further treatment from many angles, it would be premature (even if justifiable) to say that gasoline needs to be rationed to save crude oil for other purposes or other years. It may be so. I don't know yet. We cannot produce extra gasoline at the expense of critically needed war products or needed fuel oil and we must be prepared to adjust gasoline consumption to our refining, transportation and supply resources."

Basic maladjustments in location of crude-oil resources as related to transportation and refining capacity were explained to the congressmen, taking up each of the PAW districts from the Rocky Mountains to the East Coast.

"We must cope with a certain inflexibility," he said, "as to the location of our refineries. Half of the critically needed petroleum war products such as aviation gasoline, butadiene for rubber, and toluene for TNT must be produced on the Gulf Coast for the simple reason that that is where the available crude oil and refining equipment is located. War products can be only a part of the total production, and to keep up war production, we must supply crude to these refineries and haul away all of the products made.

"Is there going to be a shortage of petroleum products? The answer is there is already a shortage of gasoline in some local areas.

"Are the refineries running at full capacity? The answer is "No." The reasons for the failure of refineries to run at full capacity vary in the several sections of the country.

"It has already been necessary for us to allocate the use of crude oil in District 2. Except for those refineries which must run more crude oil than the average refinery, in order to produce a maximum quantity of critically needed petroleum war products, refineries in District 2 have been instructed to operate on less crude than they consumed in 1941. Because of a dearth of gasoline in some agricultural areas we authorized operations in June at a rate greater than had been set in some areas in May, but more crude oil is currently being used than is being brought into the district. Crude inventories are dropping at a time even before all of the aviation gasoline and toluene producing refineries now under construction in that area have been completed. We not only need gasoline, fuel oil and war products now, but we shall need gasoline, fuel oil and more war products next year. Refineries in District 2 are living in part on accumulated crude inventories and I fear we shall have to return to the lower rate of operation which we established for May."

House Committee Making Field Study of Oil Supply

WASHINGTON, D. C.—A subcommittee of the House naval affairs committee, headed by Rep. E. M. Rivers (S. C.) has been seeking information on the possibility of increasing petroleum reserves at Washington and has transferred its activities temporarily to the field. It has met at Decatur, Ill.; El Dorado, Ark., and Jackson, Miss., and is going to Dallas, Tex., Thursday and Friday followed by a 3-day session at New Orleans, La.

The Decatur meeting covered District 2 while the others are for the purpose of determining the possibility of increasing reserves in District 3. Also under consideration was the possibility of building a pipe line from the Tinsley, Miss., field to the Atlantic Coast. This line was authorized by Congress in 1942 but was opposed by PAW on the grounds of inadequacy of Mississippi's reserves and lack of known possibilities in other southeastern states.

Jay L. Taylor Assigned to Army's New Fuel Division

WASHINGTON, D. C.—Lt. Col. Jay L. Taylor, formerly vice president of the Halliburton Oil Well Cementing Co., Amarillo, Tex., has been recalled to the Army to help organize the new Fuel and Lubricants Division of the Quartermaster Corps. During the past 3 months he has been detailed to the War Food Administration at the request of Chester C. Davis, where he served as deputy administrator in charge of farm labor.

Col. E. W. Berlin, reserve officer, has been appointed chief of the technical branch by Col. W. E. R. Covell under whose direction the division was set up and who is soon to become a brigadier general. Lieut. Col. Frank E. Wilder has been named chief of the requirements branch.

The new division, established June 1, centralizes Army procurement, storage and distribution of petroleum fuels and lubricants under the quartermaster general to simplify industry contracts.

Supply Failure May Force Ration Cut in Midwest

COLUMBUS, Ohio.—The probability that petroleum supplies in the Middle West will decline to a point forcing more drastic cuts in consumption was seen here this week in an address prepared by Petroleum Administrator Ickes before the annual governors' conference. The address was read by Deputy Petroleum Administrator Ralph K. Davies because Mr. Ickes was unable to leave Washington.

"We shall," declared the administrator, "without hesitation recommend the imposition of such restrictions, when that time comes.

"As we drain more and more from the Midwest, it is quite possible—indeed, I would say probable—that the supplies in this section (the Midwest) will decline to the point where consumption will have to be cut below the present level," he declared.

OPA May Defray Higher West Coast Shipping Costs

WASHINGTON, D. C.—Transportation subsidies to facilitate the movement of petroleum products on the West Coast are under discussion between Prentiss Brown, price administrator, and Jesse Jones, secretary of commerce. This was disclosed last week in Mr. Brown's testimony before a Senate committee.

Mr. Brown said that no subsidies of this kind now are paid outside the eastern petroleum shortage area, but that he is having discussions about the "West Coast situation." He did not elaborate.

Kentucky Association To Hold Meeting July 24

ASHLAND, Ky.—The Kentucky Oil and Gas Association will hold its annual midyear meeting here July 24. The meeting will be limited to 1 day in keeping with the policies urged by the federal Government. The program, now in preparation, will include outstanding speakers in the petroleum industry.

Allowables From Poor East Texas Wells May Be Transferred to Fairway Leases

AUSTIN, Tex.—East Texas producers have been working for some time on an allowable-transfer order to be submitted to the Texas Railroad Commission as a suggested remedy to reduce the removal of water from that field. Last week, C. P. Porter of Tyler, Tex., who presided at the committee meeting, appointed Bryan Payne, president of East Texas Salt Water Disposal Co., as chairman of the subcommittee to draw up the suggested order. Also serving on the committee are Fred Weeks, Tyler; W. E. Hubbard, Houston, Tex.; C. C. Rae, Tulsa; D. W. Aiken, Jr., Shreveport, La.; R. F. Morgan, Longview, Tex., and M. Albertson of Houston.

The order was based on a recently adopted proposal to permit wells producing both water and oil to transfer their allowable to other wells making less than 25 per cent water. The committee's plan also calls for a decline curve under which shutdown wells would be declared dead when engineers decide that they have dropped to a potential of 2 bbl. daily. Major companies expressed no objections to the plan, although their representatives pointed out that there were legal difficulties in the way of immediate operation.

Water-Ratio Changed

At the present time, the Railroad Commission allows a bonus of 1 bbl. of oil for every 50 bbl. of water reinjected into the reservoir and has ordered limitation on salt-water production to 10 bbl. of water to 1 bbl. of oil.

Commenting on the proposed plan, Beauford H. Jester, commission chairman suggested that it was better to drop the water-oil ratio from 10:1 to 5:1 before proceeding to the transfer plan, a proposal later adopted.

W. S. Morris, manager of the water-disposal company said that the system is now returning 100,000 bbl. of water to the pay horizon daily and that it would soon be injecting an additional 20,000 bbl. Private injection projects are handling 75,000 bbl. of water daily. June reports show daily output of 119,000 bbl. of water which is not being returned to the formation.

A tentative proposal calls for payment of 90 cents per barrel for transferred allowable oil which would be net to the owners of closed-in wells making high percentages of water. Producers in the more favorably located sections of the field would receive the difference between 90 cents and the posted field price of $1.25, or 35 cents per barrel for lifting and handling and profit.

The entire program is under review by the Texas Railroad Commission which has not yet indicated its impression of the suggested methods for making full use of the field's inherent water drive.

Compact to Hear PIWC Representatives

OKLAHOMA CITY, Okla.—Gov. Edward Martin of Pennsylvania will welcome Governors Andrew F. Schoeppel of Kansas, R. S. Kerr of Oklahoma, and John W. Bricker of Ohio and other oil states' chief executives and representatives when the Interstate Oil Compact Commission meets in Pittsburgh June 26 to study war and postwar problems of the petroleum industry.

Governor Martin's representative on the commission, Parker L. Melvin of Bradford, president of the Pennsylvania Grade Crude Oil Association, has invited the group to attend that eastern oil association's annual meeting in Pittsburgh June 25.

Three representatives of the Petroleum Industry War Council, Dr. Robert E. Wilson, chairman of its petroleum economics committee; Dr. John D. Gill, chairman of its subcommittee on cost and price adjustment, and Dr. Alexander Sachs, one of its economic advisers, will speak at the general session of the commission Saturday, June 26, in the William Penn Hotel.

Meeting for the first time in the industrial east, the commission will welcome its newest member, Ohio, and will greet Charles H. Jones, director of Ohio's Department of Commerce, Governor Bricker's recently appointed compact representative.

Regulatory officials from the oil-producing states en route to the National Conference of Petroleum Regulatory Authorities, called to meet in Washington, D. C., June 28, have been invited.

Gov. Coke R. Stevenson, executing the agreement extending Texas' membership in the Interstate Oil Compact. J. C. Hunter, Texas representative on the Compact Commission, and Charles L. Orr, secretary, Oklahoma City, Okla., look over his shoulder

Attack Dropped on Title To Offshore Oil Lands

WASHINGTON, D. C.—A new congressional attack on the title to offshore oil lands apparently has been dropped by its sponsor. Sen. Gerald P. Nye of North Dakota announced last week that he had abandoned his intention of introducing a bill to declare federal ownership of submerged oil lands below the low-tide mark, although a couple of weeks ago he let it be known that he was about ready to press such legislation. He said he had abandoned the move because of lack of cooperation.

Senator Nye has introduced similar legislation in other years and both the Navy and the Department of Justice have been interested in the subject, but the administration has never taken an open stand in support of the claim that such lands are federally owned and that present oil operators are trespassers.

Postwar Demand for U. S. Crude

by W. V. Howard

IN estimating postwar demand, it is possible to be led astray by optimistic figures on national income, the growth of aviation and so on. It is more reasonable, however, to assume that postwar demand will continue to increase in the same ratio as prewar demand and that attempts will be made to meet requirements by about the same rate of growth in domestic production and imports. There will be a tremendous foreign demand but there will also be a large foreign supply to meet it. The shifts of trade involving exports of United States crude to certain countries balanced by imports from others need not concern us. The estimated demand for United States crude, based on the past growth, is 1,450,000,000 bbl. in 1943, or about 4,000,000 bbl. daily, with increases of about 60,000,000 bbl. annually to around 1,700,000,000 bbl. in 1947.

In estimating domestic capacity to meet this demand, there is also room for considerable optimism—or pessimism. The discovery rate is declining and has been for nearly 5 years. Even if all the discoveries made last year are allotted their probable recovery rather than their estimated proven reserves, they still fell about 45 per cent short of balancing with production. It is possible to point to areas where discoveries might be made to reverse this trend but the fact is that the discoveries have not been made. It is also possible to show that if domestic fields were opened wide and the oil could be transported production could be raised 500,000 bbl. per day, or equal to the estimated 1947 demand. That is true, but by 1947, without large discoveries, production to capacity would be far below present levels. It is possible to chart the future only on the basis of known facts and the probability that existing engineering standards will prevail. Otherwise, an attempt to foresee future trends will result in wild guesses.

Estimated Production

Based on existing conditions, the trend of discovery and the present transportation system, it is probable that 1943 demands can be met but that 1944 production will fall about 40,000,000 bbl. behind estimated demand. The peak of production from existing fields, together with additions at a rate comparable to that provided by new fields during the past 4 years, will probably be reached in 1944, followed by a decline to around 1,350,000,000 bbl. or about 200,000 bbl. daily below the present rate by 1947.

This is the first of a series of articles on postwar drilling and production trends. Subsequent articles will deal with the anticipated improvements in equipment and production technique.

Based on production trends, it is believed that existing known districts in California, Louisiana, Kansas and Arkansas will reach their peak production this year. Texas will add 100,000 bbl. daily during the next 2 years and reach its peak in 1945. Among the major producing states, Oklahoma and Illinois will decline steadily.

This does not mean that these figures will be reached if there is no more drilling and no more successful prospecting. It means that these figures will be reached, even if drilling and wildcatting continue at a normal rate. It means the introduction of secondary-recovery methods in many areas.

Drilling Requirements

For the past 2 years there have been about 12,000 wells abandoned each year. Over 300,000 wells on settled production, which are not prorated, are declining slowly and steadily. This must be offset by at least 15,000 producers drilled annually and preferably around 20,000. That is, the number drilled in 1941. If this drilling is postponed now, it must be made up later. To get 20,000 producers requires the drilling of 30,000 wells. The question is, shall the equipment and the locations be available? The industry is finding about 250 new pools a year. The average ultimate production from these pools can be placed at around 3,000,000 bbl., requiring under normal 10-acre spacing around 30 wells. Over a period of years discoveries of normal size will call for 7,500 wells a year.

There is a large backlog of wells around older discoveries to be drilled and as spacing requirements are lightened and the equipment becomes available these will be drilled. California expects to add 500 wells this year as a result of the new order allowing closer spacing. Illinois expected a drilling boom when that state went on closer spacing but it did not materialize. If 5,000 wells are drilled during the average year in these old fields, that would seem a liberal estimate. Naturally every year that the industry falls short of 20,000 producers adds to the number that will be drilled during the immediate postwar period. It is anticipated that between 30,000 and 35,000 wells will be drilled annually during the postwar years, if the price is right, and that these wells will consist of an abnormally high percentage of producers because of the known proven locations.

From that point, there may be expected a steady decline in the districts now known with certain areas, such as West Texas, showing a contrary trend.

West Texas Discoveries

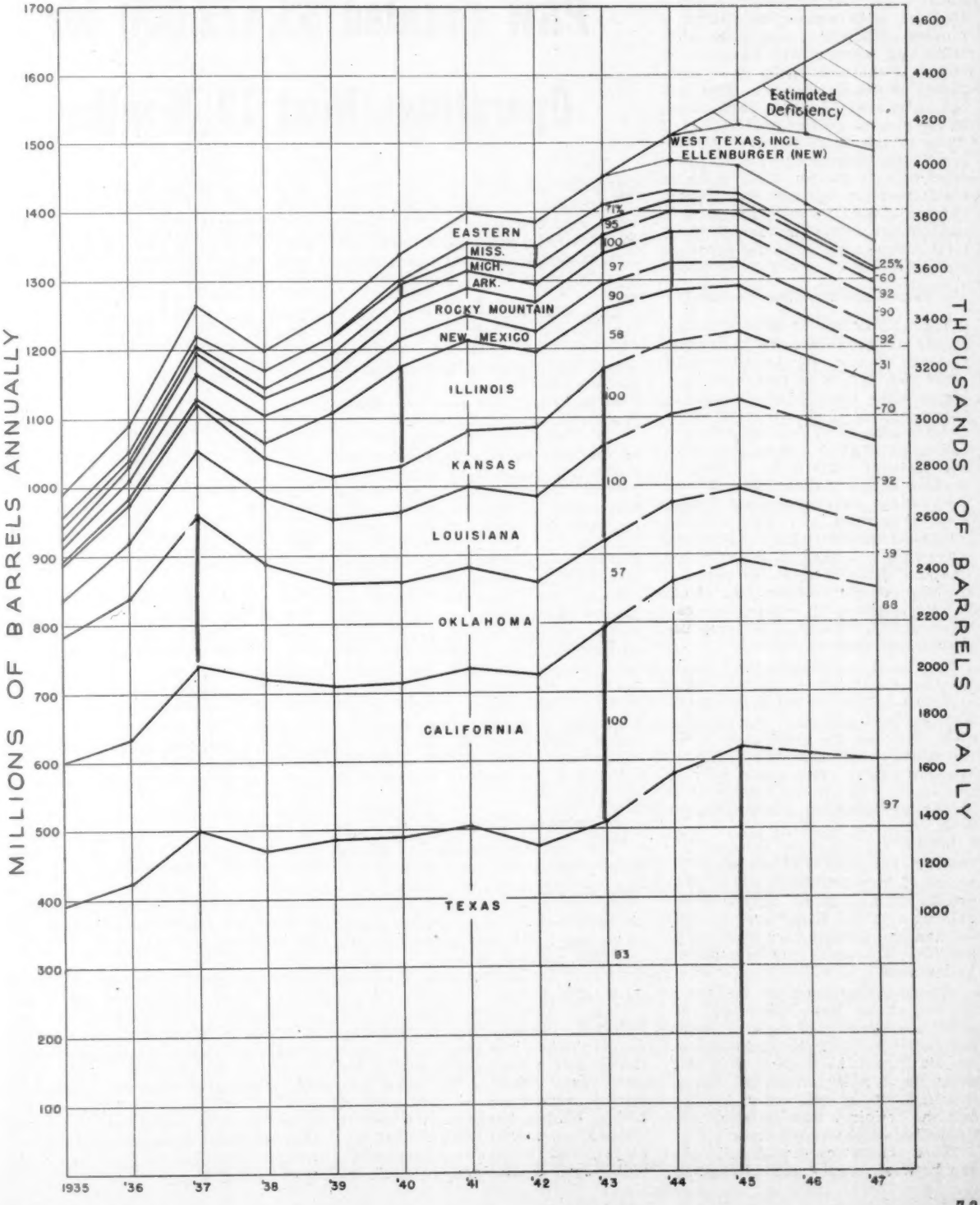
Had this report been made 3 months ago, it is probable that there would have been no break in the triangular space on the chart representing the anticipated shortage but during that time several deep wells have been drilled in West Texas which suggest eventual additions to new reserves measurable in billions of barrels. Based on those discoveries, it is estimated that deep production in West Texas, beginning from relatively small proportions today, may rise to around 120,000,000 bbl. by 1947 and possibly more.

In considering normal developments, much emphasis is placed on secondary recovery. Repressuring or flooding greatly increases production in individual fields but its effect is relatively small when considered on a national basis. The Nowata area is held up as an example of what secondary recovery may do, yet its production is only around 2,500,000 bbl. annually. To get that production requires heavy expenditures and many millions of dollars will be spent for secondary recovery in the near future. The more pessimistic the outlook for production the greater the

expenditures for secondary recovery so that if the 30,000 to 35,000 wells are not drilled on new locations, they will be drilled on old ones, as service wells, or in search of deeper pays.

A growing shortage of oil, probably accompanied by higher prices, will also encourage large expenditures for reworking old wells in an effort to

Production of crude by states, 1935 to date, and estimated demand to 1947, based on continuation of present trends. Vertical red lines indicate maximum production and figures against 1943 and 1947 estimates indicate the percentage of that maximum to be produced during those years. The lower red line in the upper righthand part shows estimated supply available from existing sources of supply and from discoveries at the present rate. A part of the deficiency may be made up by new production from the Permian basin. The remainder must be supplied from other sources



increase production. Again, the less the production available from new wells the more old ones will be called on to deliver.

On the chart, an estimated shortage is shown of nearly 500,000 bbl. a day by the end of 1947. This gap will be filled. If this additional production is to be obtained from fields in the United States, it will require some 25,000 oil wells annually, or about 40,000 completions of all kinds. If these wells cannot be drilled, a number sufficient to supply the additional oil needed will have to be added to the total wells to be completed in South America. This will not be on a well-for-well basis, owing to the present greater productivity of wells in the flush fields of Mexico and South America. Even if the lower level of 4,000,000 bbl. daily is to be maintained through 1947, it will probably require 22,000 wells annually in the United States or about 35,000 total completions, including gas wells and dry holes.

Permanent Shortage Remote

There is no fear of an oil shortage in the United States, a permanent shortage that is, for probably 5,000 years and there is no point in worrying beyond that time. A hundred billion barrels of oil are in oil shales to be recovered, at a price. At a settled price of $1.50 a barrel, oil shale will probably begin to be utilized. To replace liquid petroleum with oil from shale will require an investment of as much as is now invested in the oil industry. That may sound staggering but the oil industry has invested $18,000,000,000 to get and use around 45,000,000,000 bbl. of oil. Even greater capital expenditures can reasonably be made to get and use double that amount.

The oil-shale industry will probably be conducted by the oil industry. The mining of oil shale is foreign to the petroleum industry but from there on the experience of the oil industry will enable it to dominate the new field. The same refining processes and transportation and marketing equipment can be used for each.

Behind the oil-shale industry are the tar sands of Canada with reserves of from 100,000,000,000 to 250,000,000,000 bbl. of oil also recoverable at a price. These have already entered the picture in a small way and their utilization may be expected to increase.

Beyond the tar sands are the lignite deposits of the Great Plains and low-grade coal deposits of the type which are today keeping the Luftwaffe in the air. Again the process of mining these deposits is foreign to the oil industry but the conversion into oil and the refining, transportation and marketing of that oil is not.

These substances may not fill the gap between supply and demand by 1947 but imports could. Thus, by limiting views to the United States, the industry may be unable to foresee a prolonged uptrend in drilling. But if the perspective is enlarged to include the oil fields of the world, there seems no question but that the amount of drilling needed to supply American demand will continue to be steadily upward and that there will not be a decline in activity after the expected postwar boom. Instead, there will be a gradual transfer of that activity into foreign fields or into the development of substitutes for liquid petroleum.

PAW Granted $5,473,000 for Operations Next 12 Months

WASHINGTON, D. C. — A total of $5,473,000 to operate the Petroleum Administration for War during the 1944 fiscal year which starts July 1 is carried in the war agencies appropriation bill just passed by the House.

This is the figure recommended by the Bureau of the Budget and is $1,091,587 more than the $4,381,413 which PAW had available during the current fiscal year.

In reporting this fund the House appropriations committee said:

"This is only an apparent increase, as the 1943 amount does not represent a full annual basis of cost of the present organization. On an annual cost basis the amount recommended for 1944 shows a small reduction. However, at the end of May the actual strength of the organization was 350 below that authorized for the current fiscal year and, while the deputy administrator stated that the duties imposed on the PAW would require a larger organization for 1944 than authorized for 1943, the committee feels that it is not justified, in view of recruitment difficulties, in providing a larger force than the budget request — 132 less than the current authorized number and 219 more than the number employed at the end of May.

Committee Commends PAW

"The task of keeping the armed forces and the civilian economy supplied with petroleum products is a most responsible one, and the committee feels that it is in competent hands. If, as the fiscal year progresses, the situation appears to require consideration of further requests, the committee can do so."

Deputy Petroleum Administrator Ralph K. Davies told the committee during the hearings that he had asked the Budget Bureau for $6,990,000 for next year, which would have permitted employment of 1,949 persons both in Washington and in the district offices. At present PAW has 1,346 employes, and the new appropriation will permit employment of 1,565. At present it has authorization to employ 1,697, but has not been able to secure people to fill its vacancies. Mr. Davies did not disclose in detail what staff he had planned to employ had the Budget Bureau granted his full request, but the following table, based on information included in the printed hearings, shows the personnel of the larger divisions of PAW:

	Now authorized	Actually employed	1944 estimate
Facility security	56	27	45
Foreign	105	103	125
Legal	37	35	47
Marketing	458	259	284
Materials	144	103	129
Natural gas and gasoline	63	46	71
Reserves	40	25	38
Production	121	124	147
Refining	235	192	232
Transportation	77	71	83

Mr. Davies told the committee that the Budget Bureau made no explanation of its reductions in the various divisions, but while PAW has fully as much work to do next year as this he will try to get along with this staff without asking for a supplemental appropriation.

During the hearings Mr. Davies and his division heads were questioned by the committee on many phases of their work. Mr. Davies described PAW as a "self-liquidating agency" in that almost everyone in it is anxious to get out of the Government and back to private industry as soon as possible so there is no danger of building up a permanent bureaucracy. Among the information disclosed by the printed hearings were the following points:

The expansion program for 100-octane gasoline has run to three-quarters of a billion dollars to date.

Estimates of military demand for petroleum products have fluctuated violently. Mr. Davies said: "One handicap under which we operate is lack of knowledge of military requirements. We have had the feeling that we ought to receive more information than we do from the military people."

FOUNDED IN 1910

BY PATRICK C. BOYLE

the OIL AND GAS JOURNAL

Basis for Oil Shortages

AN eastern congressman can't understand after all the "hullabaloo" in recent months about the accomplishments of the oil industry relative to big-inch lines, aviation gasoline and synthetic rubber, that there should now be what he thinks is a reversal in form in the current discussions regarding additional petroleum shortages for civilians.

This legislator and millions of others have interpreted these transportation and war-product activities as evidence of greatly increased supplies sufficient to take care of everybody. They don't know that when the big-inch lines are completed along with smaller lines, in total transportation capacity they will represent less than half the loss in coastwise tanker shipments.

Furthermore these outsiders are not aware that the rapidly increasing quantities of aviation gasoline and other war products are being manufactured with refiners having less rather than more crude oil with which to operate. Thus as war output expands supplies to civilians must contract.

In this connection a comparison between crude-oil production in this country last week and the week previous to Pearl Harbor should be enlightening to those who can't comprehend the present critical supply situation.

This comparison reveals that the present crude-oil production is actually 113,000 bbl. daily less than it was in early December 1941. Eliminate from consideration California where there has been a substantial increase in output over the past 18 months and the decline in domestic crude oil for the remainder of the country totals 250,000 bbl. daily.

Furthermore, this quarter-million-barrel daily loss in supplies east of the West Coast has to be broken down before its full meaning in relation to present and future oil operations can be understood.

Since Pearl Harbor the Illinois basin production has decreased 160,000 bbl. daily or 40 per cent. Oklahoma's production has decreased more than 80,000 bbl. daily or 20 per cent over the same period.

These reductions and others add up to a large decline in the oil supplies available in the Middle West and upper Mid-Continent, a war-production area where approximately one-third of this country's civilian consumption takes place. Thus if there had been no war it would have been necessary to make major changes in the country's pipe-line systems in order that the deficiencies of some states could be offset with increased shipments from others.

What has actually happened is that the construction of the big-inch and other lines has been designed to partially offset the decline in tanker movements to the eastern and southeastern states and also deliver large supplies to eastern terminals for export to the war fronts of Europe and Africa.

Practically nothing has been done in transportation to balance supply and demand in domestic operations outside the eastern states. This fact plus the restricted producing operations and the increasing war demands account for the shortages.

All this means in effect that over the past year and a half petroleum's war operations have been superimposed on the existing peacetime structure. Not only has the foundation not been strengthened to carry this additional load but through the limitations on price, materials and manpower it has in fact been greatly weakened. A full realization of this situation at Washington is necessary as a basis for applying effective remedies.

How Standard of California Is Meeting the Manpower Problem

SAN FRANCISCO, Calif.—With only 5 per cent of the nation's population on the West Coast, where 10 per cent of the war industries are located, lack of manpower to produce, refine and distribute vital petroleum products has become a serious problem to western oil companies.

Standard Oil Co. of California is experiencing a shortage of trained men to staff new and expanding aviation gasoline, toluene, butadiene and other essential war plants. If the drilling program is stepped up to meet increased demands for crude oil, it is expected there will not be sufficient trained men to do the work.

Technical men — engineers, chemists, research specialists, geologists— are at a premium for development of new war products and plants. This situation is aggravated by the equally critical need for such men in the Army and Navy, as well as in other expanding war industries. Selective Service has understood this need and has granted deferments in most cases where technicians were engaged in essential war work.

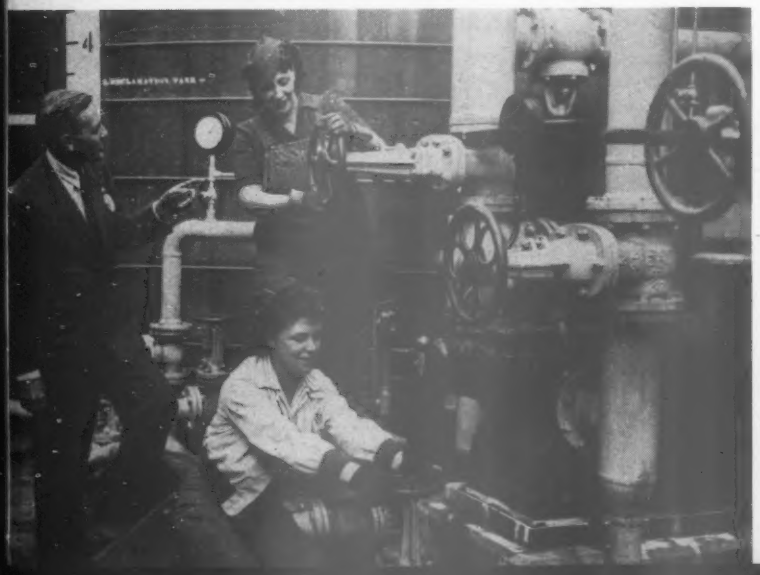
The tremendous expansion of the merchant marine has caused a scarcity of licensed and unlicensed seagoing personnel. However, tanker operations have fared reasonably well due to cooperation of the U. S. Maritime Commission and Selective Service in recognizing the importance of the tanker fleet.

Probably the most severe manpower problem is faced by Standard of California's retail marketing operations, as is to be expected. The wholesale phase of marketing has not yet suffered much, although some shortage is felt in specially trained personnel, such as lubricating engineers.

To help solve its own manpower problem, Standard of California drew up a plan of action as follows: (1) Substitution of women for men; (2) use of part-time workers and physically handicapped persons; (3) "job priorities" schedule, and (4) simplification of jobs.

Women have taken over men's jobs, with the exception of heavy work entailing lifting beyond the legal limit of 25 lb. and, in most cases, work requiring special technical training, with much more success than anticipated. Even old-time supervisors, who insisted that women could never perform men's work, are reluctantly changing their minds.

In Standard of California refineries women fill, clean and stencil barrels; solder, make cans, fire stills; gage, pump, operate control houses; act as laboratory inspectors, chemists, samplemen and bottle washers. As they develop the necessary skill, they will become stillmen, treaters and hold other operating jobs. Although they have been employed as gas testers, laboratory assistants and as oilers or helpers in natural-gasoline plants, the use of women in field operations is



Left: Power-department foreman explains process of chemically treating water used in the refinery. (Picture courtesy San Francisco Examiner.) Below: Here a trainee, coached by a woman instructor, extinguishes a fire with steam under pressure

still somewhat restricted because of the heavy nature of the work. On service stations women are being employed in increasing numbers.

General experience has shown that training programs for women in operating jobs must be carefully developed. Feminine applicants for this work are given a simple aptitude test to determine if they are mechanically inclined. If accepted, they are put through several training periods under careful supervision before becoming full-fledged operators.

All workers in the Richmond refinery yard are required to take a fire-fighting course given by company instructors. This procedure presented a problem when the refinery began to hire women. How would they react to such a course? The solution was simple and a huge success. Six women who showed particular aptitude for the work were trained as fire-fighting instructors. When the feminine students saw the women instructors handling steam lines, foam, carbon dioxide and other types of refinery fire extinguishers, all fear of putting out roaring fires was forgotten. More than 600 women have thus far completed this spectacular course.

Personnel Obligations Increased

It has been found that more attention must be given women workers than men from a personnel standpoint. Standard of California's assistant personnel supervisor at the Richmond refinery is a woman whose duties include not only hiring women for refinery jobs but also acting as their friend and counselor. A woman was selected from among the service-station saleswomen to hold the newly created post of "special representative" for Standard Stations, Inc. She travels throughout the West, talking with women at company stations, seeking their suggestions and criticisms.

The company found that lighter jobs could be performed by the physically handicapped, including disabled men returning from combat zones, and older persons.

A "job priorities" program has been adopted by Standard of California to eliminate nonessential work. It provides for the gradual transfer of manpower from nonessential jobs within the company to those which are directly needed in the war effort. One function which comes under critical review in this program is that of making out reports.

Considerable study has been given to simplifying jobs. This study has disclosed that many jobs had grown into a combination of both simple and skilled work. It has been found possible to break down three jobs, for instance, so one man performs the skilled functions of all three, leaving the routine to be divided between two inexperienced employes. Such juggling reduces the need for skilled workers.

Shipyards, aircraft and munitions plants were identified as the most critical war industries when the Pearl Harbor attack suddenly demanded their construction or expansion. Since that time, however, the petroleum industry has been accorded equal recognition for the vital part it plays in this, an oil war.

This is the second of a series by which the Journal intends to show how the petroleum industry is coping with the manpower problem. The first appeared in the June 17 issue, telling how Continental Oil Co. trains women laboratory workers. Others will follow as rapidly as compiled.

Above: Employment of women in oil-field jobs is restricted because much of the work is too heavy. It takes husky, trained men, such as these two, to maneuver elevators and hooks used to handle drill pipe

Above: It's the know-how that counts. Trained technical men, such as this Standard of California research scientist, are at a premium for development of new war products and plants

Left: The first women still operators to complete the training course at the company's Richmond refinery pose with their instructors for their "graduation picture"

Public Hearing Planned On Federal Unitization

WASHINGTON, D. C.—A public hearing in the early part of October, probably in Denver, Colo., will be held for the purpose of discussing general regulations for development and operation of oil and gas unit plans involving public lands, it was announced last week by the Department of the Interior.

The invitation issued April 10 by the U. S. Geological Survey for expressions from the public on unitization policies has proven conspicuously successful, Secretary Ickes declared.

"Director Wrather informs me," said Secretary Ickes, "that the suggestions and criticisms submitted disclose a widespread interest and have furnished a considerable volume of highly important ideas which will be useful in determining desirable changes in the proposed regulations. The director feels that a public hearing for a discussion of such changes and to explain the purpose of the regulations is fully justified and should be held in advance of their promulgation.

"He recommends that such a hearing be delayed until after sufficient time has elapsed to permit careful analysis of all comments that have been submitted and an adequate opportunity has been afforded interested persons to arrange to be present. Details of the time and place will be announced by publication in the Federal Register not less than 30 days in advance of the day of the hearing."

Deussen, Ivy and Huntley Make Lago-Creole Analysis

NEW YORK.—A new appraisal of Lago Petroleum Corp. and Creole Petroleum Corp. properties in Venezuela is now under way, it was reported here last week by C. H. Lieb, president of both companies, "for use in connection with any new proposals to the stockholders" looking to the eventual merger of the two concerns.

Alexander Deussen and John S. Ivy of Houston, Tex., and Louis G. Huntley, Donna, Tex., independent geologists, compose the commission engaged to make the new appraisal.

Mr. Lieb said that the appraisers are now in Venezuela, and after the completion of their field investigations, they will be located in New York from July 19 to 24, inclusive, to receive from the stockholders and managements of the two companies any data which may be of assistance in reaching a conclusion as to a fair ratio of value between the properties involved in the proposed exchange of stock.

"The principal purpose of having new appraisals made," Mr. Lieb explained, "is the desire on the part of the managements to exhaust every reasonable means of satisfying the stockholders of both companies that the valuations which may be established as a result of such new appraisals are fair and that the terms of exchange which may be based thereon are equitable."

If directors of the two companies are able to reach an agreement on terms, after the reappraisal, a special stockholders' meeting will be called to approve a plan of reorganization.

Retailers Allowed to Meet Reference Prices

WASHINGTON, D. C.—Retail dealers of petroleum products who are not tank-wagon buyers at a particular retail establishment may increase their maximum prices by the difference between delivered cost on June 19, 1943, and the maximum tank-wagon price of the reference seller at that point, the Office of Price Administration ruled last week.

This change is embodied in Amendment 35 to Maximum Price Regulation 137, effective June 19, 1943. This amendment cites these illustrations how the ceilings may be adjusted.

1. A service-station operator of a central storage bulk plant from which he supplies only his own service stations and who makes no tank-wagon sales to other service stations has a maximum retail price for gasoline at his service station of 18 cents per gallon. His delivered cost of gasoline at that station is 15 cents. The tank-wagon price of gasoline of the reference seller at that point is 16 cents. Then the service-station operator may increase his retail price 1 cent per gallon to 19 cents. This is the amount of the difference between his laid-down cost of 15 cents and the reference seller's tank-wagon price of 16 cents at that point.

2. A service-station operator who operates his own bulk plant and makes tank-wagon sales to other service stations has a maximum retail price at his station of 19 cents per gallon and his delivered cost at that station is 15 cents. His tank-wagon price to other service stations is 16 cents, and the reference seller's tank-wagon price is also 16 cents. In this case the maximum price at his station may be increased 1 cent per gallon to 20 cents.

3. A service-station operator purchases gasoline by tank car for direct delivery into his service-station tanks, and his maximum retail price is 16 cents per gallon. His delivered cost is 10 cents per gallon, whereas the reference seller's tank-wagon price is 14 cents per gallon at that point. The operator may increase his maximum price by 4 cents to 20 cents per gallon.

Emergency Field Stocks Arranged in District 4

DENVER, Colo.—Relief for small operators in Wyoming and Montana engaged in drilling exploratory wells but handicapped for lack of tubular goods is in sight as a result of instructions from PAW headquarters in Washington to Michael J. Foley, director, District 4, at Denver.

PAW advised that emergency stocks will be placed with supply dealers at Casper, Wyo., and Cut Bank, Mont., consisting of well casing and tubular goods, upon which operators may draw after clearing through the producing department. Supplies will consist of 600 tons at Casper and 400 tons at Cut Bank. These will, in effect, constitute a revolving pool, with supplies replaceable as withdrawals are made so they can be held at the figures named.

Field stocks are for the use primarily of small operators for exploratory wells, but also will be available for operations in producing fields where requirements are not sufficient for purchases through regular channels in car lots. Major operators also may obtain use of these goods in emergencies by clearance through the production department of PAW.

One Producing Day Added For Texas Fields in July

AUSTIN, Tex.—A net daily production of 1,728,136 bbl. of all petroleum liquids in July was authorized June 21 by the Texas Railroad Commission. At the same time the commission announced a reduction of the water-oil ratio in the East Texas field from 10 bbl. of net water to 5 for each barrel of oil produced.

The schedule for July permits 23 producing days in the East Texas field, an increase of 3 days; 24 days in the Panhandle, and 22 days for most other fields of the state, in each of the latter cases an increase of 1 day over June.

The net allowable of crude oil totaled 1,702,721 bbl. daily, compared with 1,588,414 for June. It was estimated that underproduction of crude during July would total 5.32 per cent or, 90,585 bbl., with a production of 116,000 bbl. of condensate and natural gasoline.

The commission's authorized production exceeded the PAW certification of 1,727,000 bbl. by 1,136 bbl. Col. Ernest O. Thompson, commissioner, in a statement declared that the commission, after considering field nominations of purchasers, had allowed all of them "up to the figure which the commission considers to be the maximum producing ability."

Large Engineering Group Attracted By A.S.M.E. Petroleum Meeting

by L. P. Stockman

Abstracts of several technical papers presented at the annual meeting of the Petroleum Division, American Society of Mechanical Engineers, appear in the Engineering and Operating Section of this issue. They start on page 132.

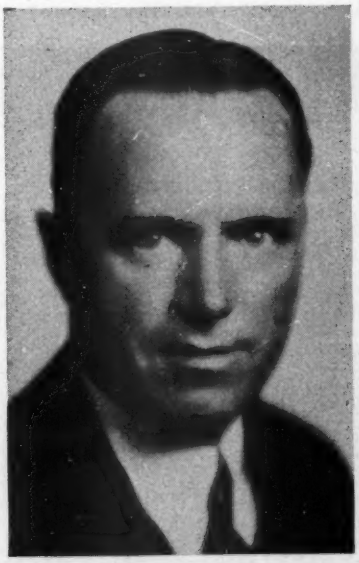
LOS ANGELES, Calif. — The semiannual meeting of the American Society of Mechanical Engineers held in Los Angeles at the Biltmore Hotel June 14 to 17, inclusive, was attended by an unexpectedly large number of coastal engineers. The first 3 days of the 4-day session were devoted to aviation in all its various phases ranging from production engineering to heat transfer, hydraulics, applied mechanics and employment. The final day of the meeting was devoted to rubber and plastics and petroleum.

John S. Gallagher of the Texas Co. presided at the morning session of the petroleum meeting at which papers were presented on Design and Development of Portable Drilling Equipment, by James Moon; Engine Wear and Its Study in Measurement of Lubrication, by A. G. Cattaneo, W. Gasser and W. W. Malott, of Shell Development Co., Emeryville, Calif.; and Interpretation of Analytical and Volumetric Data in Terms of Field Measurement, by B. H. Sage and R. H. Olds of the California Institute of Technology, Pasadena, Calif. The afternoon session was presided over by L. V. Horne, Union Oil Co., Los Angeles. At this session three other papers were presented. These were Requirements for Relief of Overpressure in Vessels Exposed to Fire, by James Duggan, C. H. Gilmour and P. F. Fisher of Carbide & Carbon Chemicals Corp., South Charleston, West Virginia; High Pressure Pipe-Line Research, by F. W. Laverty and F. M. McNall of Clark Brothers Co., Inc., Olean, N. Y.; and Butadiene Plant of the Southern California Gas Co., by J. G. Rollow, of the gas company, Charles H. Smith of C. F. Braun & Co., Arcadia, Calif., and H. L. Masser of Southern California Gas Co.

Production and Tool Session

The American Society of Tool Engineers joined with the A.S.M.E. Production Engineering and Aviation Divisions in sponsoring a morning and evening session on June 15. H. L. Eggleston of Gilmore Oil Co. and past president of California Natural Gasoline Association, was chairman of subcommittees, and E. M. Wagner headed the Technical Events. Harold V. Coes, president of A.S.M.E., was present and opened the general session and business meeting. The president announced at conclusion of the business session the 1944 semiannual meeting of the society would be held in Pittsburgh, Pa.

The paper on Requirements for Relief of Overpressure in Vessels Exposed to Fire came in for considerable discussion. C. C. Ashley of Shell Oil Co., Inc., submitted his own views as well as those of Standard Oil Co.



H. L. Eggleston, Gilmore Oil Co., Vernon, Calif., past president of the California Natural Gasoline Association, was active in subcommittee work at the Los Angeles meeting

engineers and maintained that the recommendations of the authors were erroneous and conflicted with A.P.I. findings on standardized practice. Turner Smith of General Petroleum Corp. also objected to the findings and recommended against adoption of the paper's formula which was considered inconclusive. It was also brought out during the discussion the authors used vertical tanks for these experiments whereas butane and other light hydrocarbon fractions are stored in long horizontal tanks in California. The primary objective of this paper was to determine the pressure relief capacity necessary to insure safety of pressure vessels. The paper concluded that it was believed that pressure-relief areas should be designed on the basis of 20,000 B.t.u. per hour per sq. ft. of wetted surface exposed to fire. In addition to questioning this 20,000 B.t.u. factor it was not believed the contents of vessels involved in fire would absorb heat at this rate as hydrocarbons as a rule are poor conductors of heat. In suggesting that further study be made of the subject one member brought out the fact that in the construction of synthetic-rubber plants by 15 companies and 12 of the top engineering concerns in the country there were almost as many different recommendations as there were representatives. This indicated a definite lack of unanimity as to what size the pressure vents and relief valves should be.

Butadiene Plant Described

J. G. Rollow of Southern California Gas Co. outlined the revamping of equipment in the company's Macy Street artificial-gas generating plant which for several years had been held as a standby unit to make up any shortage of natural gas during periods of peak demand, and the large amount of new equipment added. Negotiations which had as the objective the conversion of the 10 gas-generating units of this plant to the production of butadiene began in April 1942. Upon completion of pilot-plant tests, contracts were signed and construction work got under way very soon. The first construction work was the rebricking of the gas-generating units which required over 1,000,000 fire brick. The generating units are

equipped to burn either oil or gas and will operate to some extent on both as the plant will produce a substantial amount of artificial gas as a result of operations. This gas will be stored in a newly constructed holder and will be used as needed. Next a 125-ft. chimney or stack was erected and soon thereafter pressure vessels and other equipment began arriving and erection work continued for several months. Extraordinary safety precautions have been taken and in case of necessity complete shut down and stoppage of all operations can be accomplished in 5 minutes. The raw butadiene produced in this plant will be moved 20 miles by pipe line to the Shell's major butadiene plant at Torrance for further processing and final conversion to synthetic rubber in conjunction with styrene now being produced by Dow Chemical Co. adjacent to the Shell plant. For military reasons it is impossible at this time to reveal the route of flow or designate the various types of equipment employed. This was one of the most interesting papers presented but for obvious reasons it was not thrown open to general discussion and the paper will not be released for publication. The general types of equipment used show no major deviation from equipment employed in other similar installations including absorption, distillation, fractionation, compression and other adopted practices and the use of catalysts, superheaters, preheaters and other conventional equipment. Two byproducts, a heavy oil and tar residue from the naphtha-distillate charging stock, are deposited in a completely enclosed concrete reservoir in a closed system whereby condensed steam and water moves over a series of weir boxes and is returned to the system. Original water softening equipment has been expanded. The Southern California Gas Co. plant has been in partial operation for several days and will be under full charge within the next 2 weeks.

Conflicting Trends in Gasoline Consumption

(Continued from Page 74)

grams are concentrated in Texas, these qualified observers assert. The training programs, along with the expanded operation of service equipment necessary in building, maintaining and supplying the military establishments account for the higher consumption, marketers claim. Consequently, declare distributors of motor fuel in the military training centers, it is not at all surprising that total consumption has increased over peacetime periods.

Consumption in March of 1,640,833,000 gal. of motor fuel, only 15.8 per cent less than a year ago, is the least violent decline in gasoline use since last December when extension

HOUSTON TECHNICAL CLUB HOLDS ANNUAL OUTING

These Gulf Coast engineers posed for the Journal's cameraman at the annual spring outing of the Technical Club of Houston, Tex., at the Brae-Burn Country Club. Lawrence O'Donnell, chief mechanical engineer for Shell Oil Co., Inc., is president of the club which is composed of men employed in engineering and other technical capacities in the oil industry

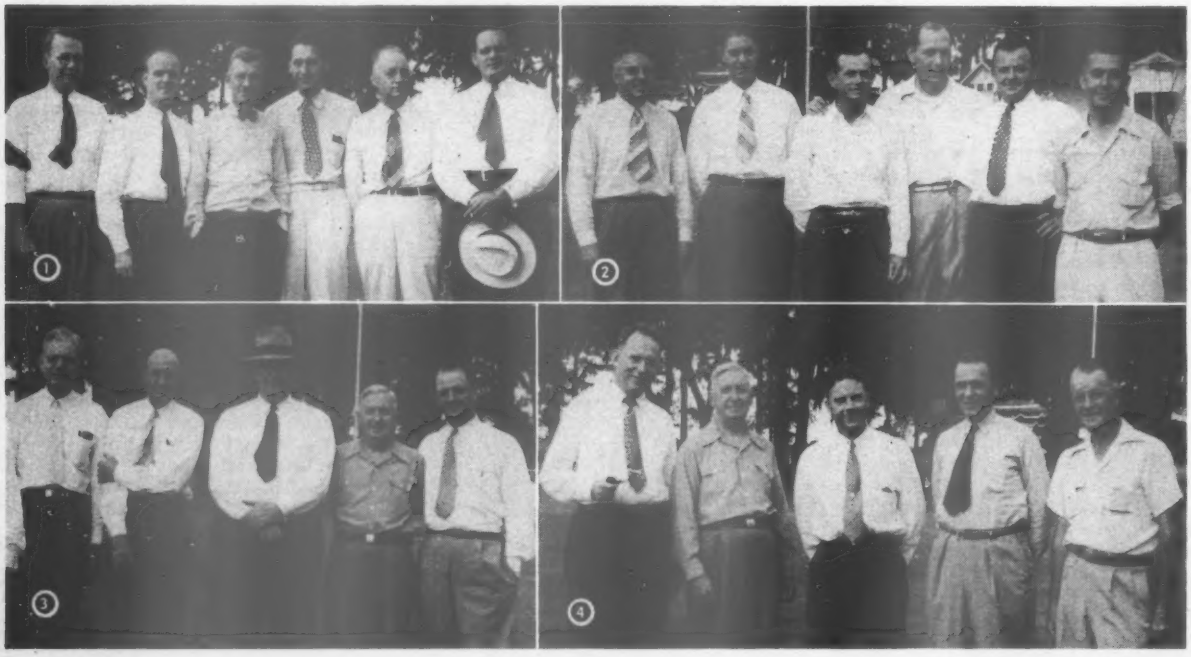
Photo 1—W. H. Larkin, Larkin Packer Co.; Harry Catlow, Republic Supply Co.; "Army" Armstrong, Republic Refining Co.; Charles Finkle, Walworth Valve Co.; O. Q. Lomax, Humble Pipe Line Co., and H. D. Carmouche, Houston Oil Co.

Photo 2—J. M. O'Melveny, Patterson-Ballagh Co.; Carl Lee, Shell Oil Co., Inc.; C. B. Burton, Burton Drilling Co.; Charlie Fontaine, and W. J. Nutto, Reed Roller Bit Co., and F. S. Mims, Larkin Packer Co.

Photo 3—Ted Miller, Bethlehem Supply Co.; Sam H. Harper, Pure Oil Co.; O. D. Story, Shell Oil Co., Inc.; Hu M. Harris, formerly drilling superintendent for Humble Oil & Refining Co., now retired, and Tom Alexander, Larkin Packer Co.

Photo 4—Bob Chenowith, Oil Well Supply Co.; Mr. Harris; M. W. Peters, Humble Oil & Refining Co.; Paul Lathrop, United Supply Co., and Ed Seeman, Bethlehem Steel Co.

Chet Whaley, Petroleum Well Service Co., in the circle, was general chairman of arrangements.



of civilian rationing to a national scale in November resulted in a precipitous drop of 32.79 per cent.

A moderate decline of 6.7 per cent was reported in March for PAW District 5, the Pacific Coast area. California consumption of 183,605,000 gal. during the month, a reduction of only 3.2 per cent, is the chief factor in sustaining western consumption at current levels.

The Rocky Mountain area, District 4, was 11.7 per cent off the 1942 gasoline-consumption pace in March. Utah's increase of 2.8 per cent tended to modify the more substantial declines in the other four reporting states.

More than half of the eastern states consumed 30 to 42 per cent less gasoline in March than a year ago, a reflection of the more severe rationing applicable to that part of the country and to prohibitions on pleasure driving.

Tennessee, with an increase of 4.2 per cent, and Nebraska, showing a gain of 0.6 per cent, are the only two states in District 2 which consumed more motor fuel in March this year than a year ago. The other 13 states in the district reported declines ranging from 10.1 per cent, in the case of Illinois, to 37 per cent in North Dakota.

Hearing Asked Before Midwest Rations Are Cut

CHICAGO.—Request for a full hearing on the subject before any governmental agency imposes deeper gasoline rationing on the Middle West was registered here last week by the PAW general committee for District 2.

"The war," declared O. D. Donnell, Findlay, Ohio, chairman of the general committee, "has made the entire nation tremendously oil conscious. Current discussions before congressional committees concerning possible extension of the ban on pleasure driving and reduction in gasoline coupon values now in effect on the eastern seaboard to the Midwest have created widespread public interest and discussion. The general committee for District 2, acknowledging its responsibilities to its public which includes everybody, requests that no final action be taken by any governmental agency contemplating deeper gasoline rationing in the Midwest until after full hearing on the subject is accorded the industry committee for District 2.

"Fully cognizant that military and war industry demands for petroleum must be given just preference, the committee voiced its strong opinion that increased immediate agricultural demands for gasoline in the Midwest alone precludes any drastic action during the next 90 days."

Federal Order Digest

WPB Regulations

Steel—CO M-21-b-2, amended: Authorized warehouses distributing merchant-trade products to replace on an equal basis stocks sold on any type of approved controlled materials order, issued June 15.

Preference Ratings—PR 3, Interpretation 2: Cancels ratings applied to orders for items appearing in Lists A, B and C which were not filled by June 4, 1943, if they are not in conformity with restrictions imposed on that date, issued June 12.

Protective Oils—CO M-332: Establishes control over oils for protective coatings, effective July 1.

General Construction—Form WPB 617: Specifies that applications for authority to begin construction and for priority assistance must be filed on new form, replacing PD-200, may be used now, mandatory after July 1.

Rerating—CMP 1, Direction 14: Dispenses necessity of rerating delivery orders placed prior to May 16, if purchaser applied to the order the preference rating assigned to him with an advance allotment, issued June 14.

Allotment Numbers—CMP 3, Interpretation 3: Requires continuance of system of identifying all rated orders for production materials with the allotment number assigned to the rated production schedule, issued June 15.

Replacement Orders—CMP 1, Direction 16: Gives precedence to orders for replacement of controlled material rejected by customer because of nonconformity with specifications, issued June 17.

Tractor Parts—SLO L-53-b, amended: Simplifies control over distribution of repair parts for track-laying tractors, effective June 17.

Controlled Materials—CMP 1, Interpretation 9: Authorizes manufacturers to apply for and customers to make allotments during a single quarter of the quantity of controlled material required to produce a minimum practicable quantity of a product, even though the customer's requirements for that product may run over several quarters, issued June 16.

Motor Controllers — CO L-250, amended: Makes minor changes in order covering electric-motor controllers, issued June 16.

Steel—CMP 1, Interpretation 8: Requires that producers who have accepted orders that cannot be shipped in the month requested must immediately notify the customer and take corrective steps, issued June 18.

Rubber Orders

General Order—ORD R-1: Relaxes certain restrictions on allocation and use of synthetic rubber, tightens control over stockpile of crude rubber, supersedes M-13, M-15-b, M-15-b-1, M-15-d, M-15-e, M-15-f, M-15-g, M-15-h and GPO M-46, effective June 18.

OPA Regulations

Crude Prices—RPS 88, Amendment 109: Permits a rise of 7 cents per barrel in the ceiling price for crude in the Texas Panhandle, including Carson, Gray, Hutchinson, Moore and Wheeler counties, effective June 16.

Rubber Pricing—MPR 149, Amendment 11: Postpones for 23 days effective date of regulation establishing a formula for pricing mechanical rubber goods containing synthetic rubber bought at lowered prices, effective June 17.

Bunker Fuel — MPR 189, Amendment 11: Subjects each supplier to the same bunker fuel maximum prices where one supplier purchases a quantity from another supplier, effective June 18.

Rationing — Instructions issued to local rationing boards in eastern states to deny application for supplemental mileage if the car owner lives within 1½ to 2 miles of his job, issued June 18.

Retail Oil Dealers—MPR 137, Amendment 35: Authorizes increase of maximum prices by the difference between delivered cost on June 19, 1943, and the maximum tank-wagon price of the reference seller at that point, if the dealer is not a tank-wagon buyer at that particular retail establishment, effective June 19.

Services—MPR 165, SSR 7, amended: Permits commission sellers of heating oil in 33 rationed states and District of Columbia, to advance ceiling prices 3/10 cent per gallon, effective June 22.

ODT Regulations

Deliveries — GO ODT 17, Amendment 3a: Prohibits retail delivery in eastern shortage area of packages which measure less than 60 in. in combined length and girth, weighing less than 5 lb., effective June 18.

Gasoline Preference—Revises list of industries given preferential treatment, on supplies, issued June 19.

Navy Cancels Contract On Elk Hills Reserve

WASHINGTON, D. C.—The Navy has terminated its contract with Standard Oil Co. of California for development of the Naval Petroleum Reserve 1 (Elk Hills) following an opinion by the Department of Justice that the contract is not authorized by applicable legislation.

The contract had been criticized in Congress, and an investigation of it probably will be continued in spite of its cancellation. The House committee on public lands opened an investigation last week but postponed hearings until this week after a brief appearance by Norman M. Littell, assistant attorney general, who told the committee:

"I have made an exhaustive examination of the contract, both on the facts and on the law, and I have reached the conclusion that the contract is illegal and invalid under the act of June 30, 1938."

He added that his opinion had been forwarded to the White House but had not reached the president. On the same day the Navy Department announced that the contract was being terminated in agreement with Standard of California, and that necessary adjustments would be made. The statement defended the contract and said it was not entered in secret and contained no improprieties.

Official Explanation

In a formal press release the Navy Department said, in part:

"The secretary of the Navy, upon notification of the willingness of the Standard Oil Co. of California to terminate the contract for the operation of the Elk Hills naval oil reserve, announced that prompt steps would be taken to terminate the arrangement and make the necessary adjustments.

"The secretary of the Navy also declared that his own investigation established the fact that no improprieties had been employed by either party to the negotiations. The secretary added that 'the acting attorney general has asked me to say that the Department of Justice wishes to join in the latter statement and concurs fully and emphatically.'

"The agreement to terminate the contract was due to the legal opinion of the Department of Justice that the proposed arrangement exceeded the authority granted by the law.

"The contract was negotiated with that company by a distinguished officer of the Navy, Rear Adm. H. A. Stuart, U.S.N., director of naval petroleum reserves, in good faith and mutual anxiety to resolve this problem which has been a major concern of the Navy for many years. It provided for conveyance of Standard's lands to the Government, for operation of the field as a unit, for limited production for the next 5 years to contribute to current war needs, and for shutting in the wells altogether thereafter in the Navy's sole discretion.

"The agreement was officially announced by the Navy by a news release last December, was discussed in trade journals, and copies were submitted to the Navy subcommittee of the House appropriations committee in February. Statements that it was not intended to make the contract public are unwarranted and false.

"Last March the secretary of the Navy requested the secretary of the interior to review the contract. As a result of Secretary Ickes' review, the secretary of the Navy referred the matter to the president, who forwarded it to the attorney general for investigation and report on March 26. It was in consequence of this action by the president that the attorney general reached the opinion above referred to.

"The Navy regards the protection of the future petroleum supply for the Fleet as a primary responsibility. It proposes to pursue this objective until this end is assured."

PIWC Expands Membership Of Functional Committees

WASHINGTON, D. C. — Independent and nonintegrated representation on the Petroleum Industry War Council has been substantially expanded by appointment of additional members to three committees. (A related story on additions to the refining committee appears on p. 151.)

The action is predicated on authority extended to W. R. Boyd, Jr., chairman, at the June 2 meeting of PIWC when it was decided to increase membership of five functional committees from five to nine members.

New committee members for production and marketing are:

Production. — Parker L. Melvin, president of the Melvin-Towne Oil Co., Bradford, Pa., and president of the Pennsylvania Grade Crude Oil Association; C. P. Watson, Los Angeles, Calif., vice president of the Seaboard Oil Co. of Delaware and president of the Oil Producers Agency of California; J. C. Hunter, president of the Gregg Oil Co., Abilene, Tex., and president of the Mid-Continent Oil and Gas Association, and J. S. Bridwell, president of the Bridwell Oil Co., and president of the North Texas Oil and Gas Association.

Marketing.—Royal E. Decker, president of the Plymouth Oil Co., Detroit, Mich., and president of the National Oil Marketers Association; Howard A. Cowden, Kansas City, Mo., president of the Consumers Cooperative Association; Eric V. Weber, president of the Eureka Oil Co., Cincinnati, Ohio, and president of the Ohio Petroleum Marketers Association, and Col. T. H. Barton, president of the Lion Oil Refining Co., El Dorado, Ark.

Mr. Boyd said he had not yet decided on the additional members he would appoint to committees on transportation and on natural gas and natural gasoline.

DEATHS

W. H. Gary, lease superintendent for West Production Co. at Humble, Tex., died Thursday, June 18. He had been with that company 22 years.

Paul C. Coffin, general superintendent for Shamrock Oil & Gas Co., Amarillo, Tex., died June 22. Death was attributed to a heart attack.

Edward Prior Filley, 44, oil geologist, died at his home in Monrovia, Calif., after a long illness. His widow, two sons and parents survive.

Roy A. Reynolds, geologist and engineer, Fort Worth, Tex., died Saturday, June 19, of a blood-stream infection from which he had been suffering for the past several years.

William D. MacLean, 49, chief engineer for J. G. White Engineering Co., which is constructing an aviation-gasoline plant for Eastern States Petroleum Co., died in Houston, Tex., June 15.

David W. Fitzgerald, oil man of Oklahoma City, Okla., died there June 17, following a lingering illness. He left Bradford, Pa., 40 years ago and has made his home in Oklahoma ever since.

F. C. Lingafater, for many years building superintendent for Ohio Oil Co. in Kansas, and recently a member of the firm of L & W Drilling Contractors, with offices in Mattoon, Ill., died June 17. Mr. Lingafater was buried in Fredonia, Kans.

Alkylation and Isomerization Combined In Aviation-Gasoline Plant

by F. M. Simpson *

THE Cities Service Oil Co., Delaware, has recently completed facilities for the production of aviation alkylate at its East Chicago, Ind., refinery. The production from this unit will add materially to the available supply of 100-octane number aviation gasoline for our armed forces.

Essentially, the facility consists of an alkylation unit and a butane isomerization unit with auxiliary towers and equipment for feed and blending stock preparation. A fairly large number of alkylation plants are in operation and a few isomerization units are running in the country. This new plant is of interest as it is one of the first plants to be completed where the two processes are engineered as an integral unit.

Aviation Alkylate

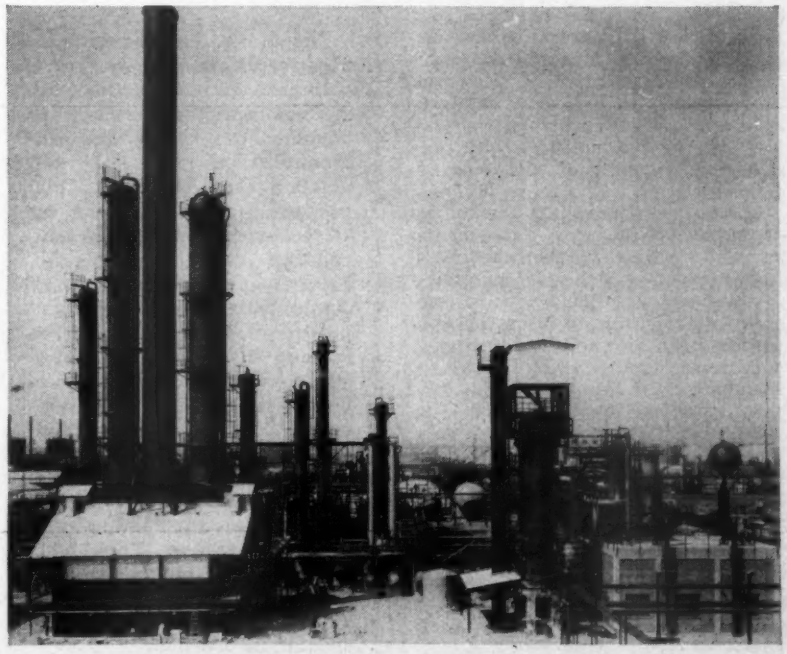
Aviation alkylate may be considered as the cornerstone of 100-octane number aviation gasoline. It is a material possessing the highly desirable properties of high initial octane number, high blending value, good lead susceptibility and low volatility. The usual practice in making final high-octane fuel is to start with aviation alkylate as a base. To this is added isopentane, a volatile, high-octane number fraction recovered from straightrun or natural gasoline, and aviation base stock. This latter is a naphtha made by selective fractionation, from selected crudes, by hydrogenation, or using catalytic cracking. As much of the naphtha is crowded into the blend as can be tolerated without exceeding maximum ethyl fluid allowance in leading to 100 octane number.

Alkylation has been defined as the reaction by which isoparaffins, aromatics and similar hydrocarbon molecules are combined with olefins and unsaturated hydrocarbons to produce larger and more complex molecular structures with certain enhanced properties. In the process described here, isobutane as the isoparaffin is reacted with butylenes.

In the mixture of gases normally occurring through operation of thermal cracking units, the ratio of C_4 olefins to isobutane is high. Even after isobutane from straightrun gasoline is added in, the ratio remains approximately two to one. Since alkylation requires approximately 1.1 times as much isobutane as olefins to complete the reaction, it may be seen that a serious isobutane deficiency exists. This shortage can be overcome by bringing in isobutane recovered from natural gasoline in the field or isomerization of normal butane which is usually abundant.

In designing the plant, a search of the field indicated a scarcity of isobutane which threatened to grow worse, so a butane isomerization unit was added. Isomerization is that reaction whereby a structural rearrangement of the atoms in a hydrocarbon molecule is effected without changing molecular weight. In this case, normal butane is isomerized to isobutane in an amount sufficient to

(Continued on Page 100)



Cities Service Oil Co.'s alkylation and isomerization unit, East Chicago, Ind.

*Cities Service Oil Co.

Catalytic Reforming of Straightrun Gasoline Increases Aromatics Content

by V. I. Komarewsky and C. H. Riesz†*

IN the past several years petroleum technology has developed in four distinct directions:

1. Analysis of petroleum mixtures,
2. Properties of pure hydrocarbons,
3. Catalytic reactions of pure hydrocarbons, and
4. Methods of catalytic processing.

These advances have been made so rapidly and in such widely separated fields that the published work does not yet reveal a complete coordination of these four topics. In this work these subjects were considered critically and were utilized in a specific application, namely, the catalytic reforming of straightrun gasoline.

The ideal reforming process is one in which a desired improvement in the nature of a petroleum product is achieved without loss of any hydrocarbon material in side reactions. In thermal reforming of straightrun gasoline when time, temperature, and pressure are the only controlling factors, side reactions always take place. These side reactions involve carbon-carbon scission (cracking), which results in the formation of gaseous hydrocarbons, and other reactions such as alkylation, polymerization and condensation which give rise to high-molecular-weight products. However, by the proper application of catalysts, a directed change in hydrocarbon nature can be accomplished with only negligible amounts of such side reactions.

In a logical approach to the subject of reforming the most fundamental knowledge required is the exact chemical composition of the raw material——straightrun gasoline. The most complete and intensive work on this subject has been accomplished by Rossini and coworkers at the Bureau of Standards in A.P.I. Project 6.[1] From these studies it was found that straightrun gasoline is a complex mixture of normal paraffin, isoparaffin, naphthene, and aromatic hydrocarbons. In general, the normal paraffin and naphthene hydrocarbons form a major part of the gasoline fraction.

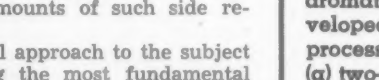
However, the methods used in the Bureau of Standards are very time-consuming and methods of analysis are now available which give reliable data on the types of hydrocarbons present and are adequate for practical purposes. The "pona" method developed by the Universal Oil Products Co. gives a rapid analysis of the types of hydrocarbons in petroleum fractions.[2] It was used in this work both for analyzing the charging stock and for the reformed products.

A knowledge of the properties of pure hydrocarbons is an important requirement in a study of reforming. The specifications for gasoline imply that regular gasoline is composed of hydrocarbons having from 4 to about 11 carbon atoms whereas aviation gasoline is made up of hydrocarbons having from five to nine carbon atoms. In addition the hydrocarbons present in gasoline may be classed according to their chemical nature, i.e., as aromatic, paraffin, naphthene or unsaturated hydrocarbons. The octane numbers of pure hydrocarbons are a function both of their molecular size and of their chemical nature.[3,4] However, in general it may be said that isoparaffins and aromatic hydrocarbons possess high octane ratings, naphthenes intermediate values and normal paraffins (with the exception perhaps of normal butane) low octane numbers. With regard to the unsaturated hydrocarbons, diolefin hydrocarbons cannot be included in any gasoline because of their instability; monoolefin hydrocarbons possess intermediate octane numbers. Thus, any reforming process which converts the normal paraffins of straightrun gasoline to some other hydrocarbon class will produce a product of higher octane number. To realize the maximum improvement, it is necessary that the entire straightrun gasoline be converted to either aromatic hydrocarbons or isoparaffins or both without side reactions. More specifically, the reactions which convert normal paraffin and naphthene hydrocarbons to either aromatic or isoparaffin hydrocarbons will bring about a maximum octane increase. Means for performing the necessary transformations are now to be considered.

Based on the known catalytic reactions of pure hydrocarbons, generalizations on the reforming of straightrun gasoline are given and an aromatization process is developed and described. This process was carried out in (a) two-stage, two-catalyst procedure; (b) two-stage, single-catalyst procedure; and (c) single stage, single-catalyst procedure. The catalytic reforming of Pennsylvania straightrun gasoline gave liquid products of high aromatic content and reaction gases containing a very large proportion of hydrogen. The large content of aromatics in the liquid products led to high antiknock values. Thus, 86.2 per cent of 80-octane product was obtained by reforming a 49-octane Pennsylvania straightrun fraction.

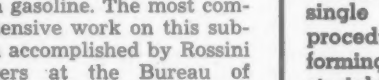
The following reactions are illustrative of known catalytic reforming reactions concerning pure normal paraffin and naphthene hydrocarbons.

Isomerization of Normal Paraffins



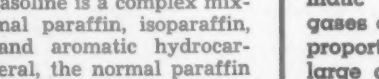
(n-Octane) → Isooctanes[5] (1)

Dehydrogenation of Normal Paraffins

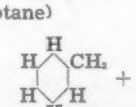


(n-Heptane) → n-Heptenes[6] (2)

Dehydrocyclization of Normal Paraffins



(n-Heptane)



+ $4H_2$[7] (3)

(Toluene)

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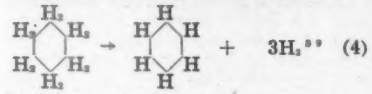
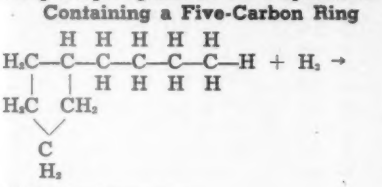
†Present address, Institute of Gas Technology, Chicago, Ill.

Dehydrogenation of Naphthenes Containing a Six-Carbon Ring

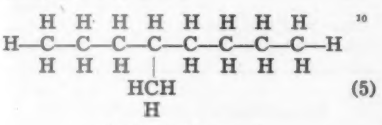


(Cyclohexane) (Benzene)

Decyclohydrogenation of Naphthenes Containing a Five-Carbon Ring



(Butylcyclopentane



(4-Methyloctane)

These catalytic reactions indicate that there are three general processes that can be applied to improve the octane number of straightrun gasoline, namely:

1. Isomerization,
2. Dehydrogenation, and
3. Hydrogenation.

The published work on catalytic reforming of straightrun gasoline that meets some or all of the criteria outlined at the beginning of this paper will now be described.

In the Zelinsky method, naphthene hydrocarbons containing a six-carbon ring are dehydrogenated to aromatics by means of nickel-alumina, platinum, or palladium catalysts at 300° 310° C. and atmospheric pressure. The reaction is quantitative and has been applied to Russian gasolines including Baku (Surakhany)[11] and Emba (Nova Bogatinsky)[12] gasoline.

Aromatization of an aromatic-free Grozny gasoline by means of various catalyst mixtures has also been described. The gasoline was passed three times over the catalyst in each experiment. The final catalyzate contained from 20 to 37 per cent of aromatics.[13]

An interesting example of the application of catalytic reactions to straightrun gasoline of known hydrocarbon composition can be found in the work of Kazansky and Sergienko.[14] The cyclohexane derivatives of a fraction of Grozny gasoline were converted to aromatics by the Zelinsky method. These aromatics and those originally present were removed by sulfuric acid to obtain a product of 45 octane number. This was passed along with hydrogen over nickel-alumina catalyst at 280°-300° C. to rupture cyclopentane rings and form paraffin hydrocarbons. The reformed product had an octane number of 52.

The foregoing is not intended to present an extensive review of the field of catalytic reforming of hydrocarbons. However, it does serve to indicate that the relationship between the chemical nature of straightrun gasoline and catalytic reforming is quite complex. Each reaction has definite catalyst and operating conditions as requirements, although in certain instances it is possible that all the necessary variables may be identical. However, when a complex material such as straightrun gasoline is considered, it becomes evident that no one process, no single set of conditions and no single catalyst can yield a maximum reforming improvement. It would be possible to divide straightrun gasoline into fractions and, after a study of the hydrocarbon nature of these fractions, select the most suited process or processes for their reforming. In the extreme case, a gasoline might be divided into fractions containing only one or two hydrocarbons and each fraction reformed under optimum conditions by means of the most suitable process. This, of course, is not practical and in this work, an alternate approach to the problem was selected, namely, fairly broad fractions of straightrun gasoline were reformed by the use of several catalytic reactions. **In the present work the objective was to produce maximum aromatization of Pennsylvania straightrun gasoline.** However, it is emphasized that other combinations of catalytic processes could be very effectively used to obtain a maximum octane number improvement.

This idea of employing specific catalytic reactions for reforming certain straightrun gasoline fractions has been used by the petroleum industry in a number of recent industrial applications. Thus, a specific naphtha fraction is "hydroformed" to produce toluene.[15] The main reactions which apparently occur are dehydrocyclization of n-heptane and dehydrogenation of methylcyclohexane, both of which produce toluene. In another application, the "isomate" process, a hexane fraction of straightrun gasoline is catalytically isomerized to produce branched chain isomers of hexane.[16]

The Houdry process has been employed to reform straightrun gasoline.[17] Thus, naphtha from Grade B coastal crude was catalytically reformed to produce 58.8 per cent of 77.6 octane aviation gasoline, 18.8 per cent of 70.9 motor naphtha and 9.1 per cent of cracked gas oil. The dry gas yield was 13.1 per cent by weight and catalyst deposit was 2.3 per cent by weight. The octane number of the charge was 57.2. It may be seen that gaseous hydrocarbons and higher molecular weight hydrocarbons were formed in this process.

It would be of interest to conduct reforming of straightrun gasoline with the aid of the newest developments in catalytic processing, namely, the Thermofor[18] or the Fluid catalyst process.[19] These processes used in accordance with the principles outlined in this work should give the closest approach to "ideal" reforming of straightrun gasoline.

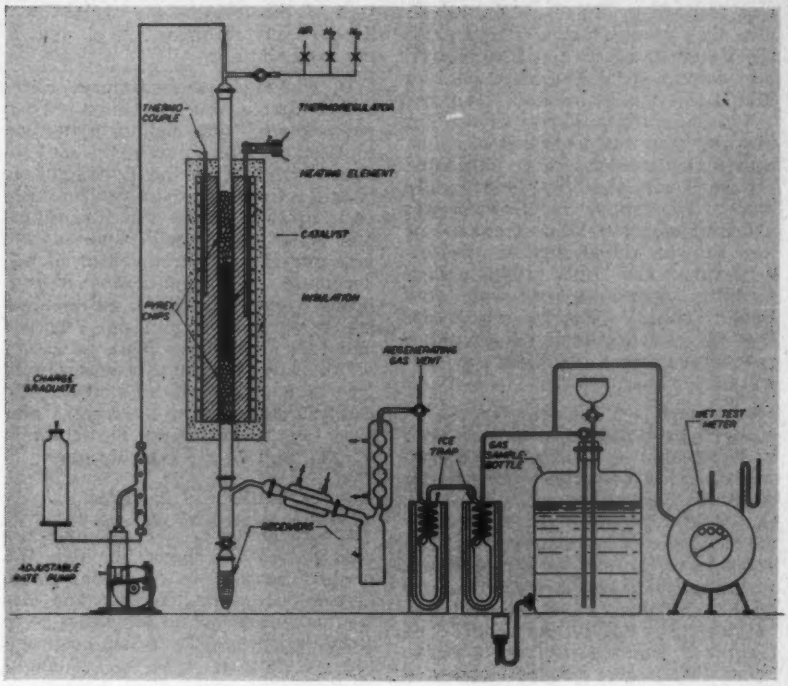


Fig. 1—Apparatus for reforming straightrun gasoline

Experimental Part

Apparatus. — The equipment employed is shown in Fig. 1. The charge

was pumped by means of an adjustable feed pump from a charge graduate to the catalyst tube. The catalyst tube contained 150-160 ml. of catalyst. The charge was completely vaporized by means of the Pyrex chips. The catalyst tube was contained in a furnace which consisted of an aluminum bronze block that was electrically heated. The catalyst temperature was obtained by means of a thermocouple (not shown) placed next to the catalyst tube. The liquid products were collected by cooling with water and finally with ice. The gas was measured by a wet test meter. Appropriate gas samples were collected over salt water in a gas holder.

Procedure. — The catalyst was brought to temperature and reduced in a stream of hydrogen. Nitrogen was then used to flush the system. After closing off the gas inlet valve, the flow of liquid was started by means of the constant-rate pump. The liquid was charged at a rate corresponding to a liquid space velocity of 0.25 volumes of liquid feet per volume of catalyst per hour. The length of run varied from 5 to 10 hours. The liquid products collected in the various receivers were blended together after completion of the run. The regeneration of catalyst is described under methods of analysis.

Preparation of Catalysts

A. Platinum - alumina. — Platinum foil was dissolved in aqua regia and evaporated to dryness. The solid was redissolved in concentrated hydrochloric acid, evaporated to dryness, then dissolved in a small amount of water. This solution was impregated on activated alumina (8-10 mesh) to give a catalyst which after drying and reduction contained 5 per cent of platinum by weight.

B. Nickel-alumina.—Sodium aluminate was prepared by adding a slight excess of sodium hydroxide to a solution of aluminum nitrate. Nickel nitrate was dissolved in a separate solution with enough nitric acid to neutralize the sodium aluminate. Upon adding the nickel nitrate-nitric acid solution to the sodium aluminate solution, the hydroxides of nickel and aluminum were precipitated simultaneously. The precipitated catalyst was washed free of anion, dried, and pilled. The composition of this catalyst after reduction with hydrogen was 25 per cent nickel and 75 per cent alumina by weight.

C. Chromia-alumina. — This catalyst was prepared by adding a slight excess of sodium hydroxide to aluminum nitrate and chromium nitrate to form a solution of sodium aluminate and sodium chromite. The hydroxides of chromium and aluminum were precipitated simultaneously by the addition of the theoretical amount of nitric acid. After washing and drying, the catalyst was pilled. The composition of this catalyst by weight was 25 per cent chromia (Cr_2O_3) and 75 per cent alumina.

D. Nickel-chromia-alumina.—Chromium nitrate and aluminum nitrate were treated with sodium hydroxide to form sodium aluminate and sodium chromite as the first solution. Nickel nitrate was dissolved in a second solution with the theoretical amount of nitric acid necessary to precipitate the hydroxides of nickel, chromium, and aluminum simultaneously when the second solution was added to the first solution. Vigorous agitation and cooling were necessary for this step. The catalyst was washed free of anion, dried, and pilled. The catalyst composition by weight was 5 per cent nickel, 25 per cent chromia (Cr_2O_3), and 70 per cent alumina.

Methods of Analysis

Liquid analysis.—The product was analyzed by the "pona" method. The method consists in determining the olefins by bromine number and molecular weight, while aromatics were found by specific dispersion corrected for olefins. The ratio of the naphthenes to paraffins were determined by refractive index.

Octane numbers were determined by the A.S.T.M. motor method.[3]

Fractional distillation of the liquid products showed that no appreciable change in boiling range had occurred during the reforming.

Gas analysis.—The gases were analyzed by the Gockel method.[2]

Carbon.—The catalyst was regenerated and the weight of carbon determined in a single operation. Air was passed over the catalyst at a rate such that the catalyst temperature was kept below the critical temperature for the particular catalyst. The water and carbon dioxide formed were absorbed and weighed in absorption tubes.

Charging stock. — The material investigated was a straightrun Pennsylvania gasoline. It was pretreated with 96 per cent sulfuric acid, followed by distillation over sodium to remove traces of sulfur. An inspection of the total straightrun gasoline is given in Table 1.

This gasoline was fractionated by a Hempel distillation[2] into four fractions. The results of this distillation and the analyses of the various fractions are given in Table 2.

TABLE 1
Inspection of Pennsylvania Straightrun Gasoline

Gravity, °A.P.I.	61.7
Octane No., A.S.T.M. motor method	44
Liquid analysis, per cent:	
Olefins	0
Aromatics	7
Naphthenes	18
Paraffins	75
A.S.T.M. distillation, °F.:	
I.B.P.	102
10 per cent	162
20	194
30	221
40	245
50	266
60	290
70	313
80	338
90	369
End point	405
Per cent over	98.0
Per cent residue	1.3
Per cent loss	0.7

DISCUSSION OF RESULTS

A. Study of Hydrocarbon Nature and Selection of Catalytic Reactions

The Pennsylvania straightrun gasoline (Table 1) was divided into four fractions. A study of its chemical nature (Table 2) revealed the following facts. The fraction boiling up to 70° C. (Fraction 1) could not be aromatized by means of the discussed reactions with the exception of one hydrocarbon — normal hexane. Since this hydrocarbon is relatively difficult to aromatize, the work was confined to the material boiling above 70° C. It may be noted that this fraction already had an octane value of 74.

The fraction boiling from 70°-100° C. (Fraction 2) consisted mainly of paraffin hydrocarbons which included n-heptane and isomeric heptanes (78 per cent). Similarly the 100°-150° C. fraction (Fraction 3) consisted largely of octanes and nonanes and their isomers (70 per cent). The naphthene contents of these fractions were 18 and 22 per cent, respectively. The bottoms (Fraction 4) contained 62 per cent of isomeric decanes and undecanes while the content of naphthenes and aromatics totaled 38 per cent. From these considerations and preliminary experiments, it was concluded that Fractions 2 and 3 are the most suitable for aromatization. The maximum degree of aromatization could be obtained by the use of two catalytic reactions: dehydrocyclization of paraffin hydrocarbons and dehydrogenation of naphthene hydrocarbons containing a six-carbon ring.

TABLE 2
Fractionation of Pennsylvania Straightrun Gasoline

Fraction number	1	2	3	4	2-3
Boiling range, °C.	38-70	70-100	100-150	Bottoms	70-150
Per cent of gasoline	18.5	15.2	33.4	32.1	48.6
Octane No., A.S.T.M. motor method	74	58	43	10	49
Liquid analysis, per cent:					
Olefins	0	0	0	0	0
Aromatics	0	4	8	12	6
Naphthenes	3	18	22	26	20
Paraffins	97	78	70	62	74

B. Two-Stage Reforming

Two-catalyst procedure. — A maximum amount of aromatization was found possible if the hexahydroaromatics in the gasoline were dehydrogenated selectively at 310° C. in the presence of nickel-alumina or platinum-alumina catalyst in one stage, while paraffins were dehydrocyclized to aromatics by chromia-alumina catalyst in a second stage at 450° C. Experiments 1 and 2 indicate the results when the 100°-150° C. fraction was aromatized by a two-stage process (Table 3). A high degree of selectivity was shown in the first stage because the reaction gases contained 98.7 hydrogen, no olefins were found in the liquid product, and the content of aromatics was increased from 8 to 36 per cent. Since the decrease in naphthenes was only 18 per cent the remaining 10 per cent of aromatics was produced by direct dehydrocyclization of paraffins to aromatics.* In the second stage the aromatic content of the liquid was increased from 36 to 54 per cent by the action of the chromia-alumina catalyst. In addition to the main reaction of dehydrocyclization, some direct dehydrogenation of paraffins to olefins was also noted. The reaction gases contained 91.2 per cent of hydrogen and, therefore, reactions other than pure dehydrogenation reactions were very slight.

It is significant to note that the simple transformation of naphthenes to aromatics only increased the octane number from 43 to 51. However, in the two-stage procedure, the combined effect of the reactions of naphthene dehydrogenation and paraffin dehydrocyclization raised the octane number to 75.

One-catalyst procedure. — In these experiments the two-stage aromatization was carried out with a single "complex-action" catalyst. For this purpose, it was necessary to develop a "triple" catalyst containing nickel, chromia, and alumina in appropriate amounts to function at two temperatures. The nickel was necessary to achieve the dehydrogenation of hexahydroaromatics at a relatively low temperature in the first stage, while the chromia produced the dehydrocyclization of paraffins when the first stage product was repassed over the same catalyst at a higher temperature. Both catalyst materials were coprecipitated with alumina. Preliminary experiments were conducted with pure n-heptane and cyclohexane and it was found that dehydrogenation of cyclohexane without olefin formation could be conducted at temperatures of 300° to 410° C., depending upon the nickel content of the catalyst. A catalyst containing 5 per cent nickel, 25 per cent chromia, and 70 per cent alumina, which functioned satisfactorily with pure hydrocarbons, was selected for the gasoline reforming experiments.

*This has been noted for pure paraffin hydrocarbons.[20 22]

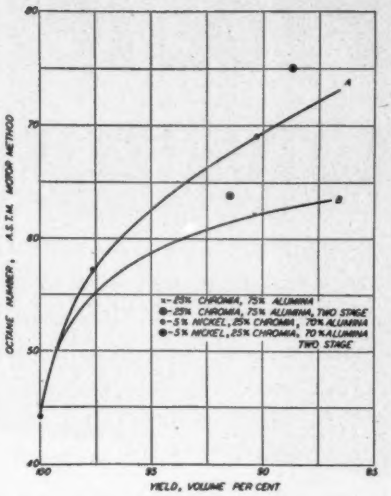

OCTANE NUMBER, A.S.T.M. MOTOR METHOD
YIELD, VOLUME PER CENT
A-25% CHROMIA, 75% ALUMINA
B-25% CHROMIA, 75% ALUMINA, TWO STAGE
C-5% NICKEL, 25% CHROMIA, 70% ALUMINA
D-5% NICKEL, 25% CHROMIA, 70% ALUMINA TWO STAGE

Fig. 2—Yield-octane relationship for reforming 100°-150° C. fraction

The two-stage, one-catalyst aromatization of the 100°-150° C. fraction was carried out with a "triple" catalyst of 5 per cent nickel content at 405° and 450° C. (Experiments 3 and 4, Table 3). A large amount of aromatization occurred and the aromatic content of the reformed product was 60 per cent.

Corresponding to the large increase in aromatic content, the liquid product had a large increase in octane number. Thus 88.8 per cent of 75-octane product was received from the 43-octane charging material. The yield-octane curve for single-stage reforming with the same nickel-chromia-alumina catalyst is given in Fig. 2 (Curve A). From this curve it may be noted that an 88.8 per cent yield of product by single-stage reforming would give a product of only 71 octane number. Thus, the more efficient nature of the two-stage process is obvious.

The 100°-150° C. fraction was reformed with chromia-alumina catalyst in both two- and single-stage procedures (Experiments 6, 7, and 8, Table 3). The yield-octane data for single-stage reforming is plotted as Curve B (Fig. 2) and it may be again noted that two-stage process gave improved results. Thus, 91.6 per cent of 65-octane produced was produced by the two-stage process whereas the same yield of only 61.5 per cent would be obtained by single-stage reforming with the chromia-alumina catalyst.

The importance of nickel in the reforming of the 100°-150° C. fraction is clearly brought out by Fig. 2. In either single or two stages, better yield-octane relationships are obtained with the nickel-containing catalyst. These facts can only be attributed to the directing influence of nickel in producing aromatics from hexahydroaromatic hydrocarbons.

C. Production of Aviation-Base Gasoline

As was noted in the preceding section, a large increase in octane number was obtained by aromatizing the 100°-150° C. fraction in a two-stage, two-catalyst procedure. It was of interest to apply this method as a means of producing an aviation-base gasoline. This procedure was therefore applied to the 70°-150° C. portion

(Continued on Page 119)

TABLE 3
Aromatization of Pennsylvania Straightrun Gasoline

Experiment	1	2	3	4	5	6	7	8	9	10	11	12
Fraction aromatized	3	Exp. 9 product	3	Exp. 3 product	3	3	Exp. 6 product	3	2-3	2-3	2-3	Exp. 11 product
Catalyst	A&B*	G	D	D	D	C	C	C	C	C	A	C
Temperature, °C.	310	450	405	450	450	405	450	450	450	475	310	475
Liquid recovery, vol. %	93.5	86.6	95.4	93.1	90.7	98.5	93.0	90.9	89.8	85.2	96.1	88.7
Carbon, weight, %	0.0	2.1	1.0	1.5	2.9	0.7	1.1	1.9	2.8	3.1	0.0	2.7
Oct. No., A.S.T.M. motor method	51	75	57	75	69	50	64	62	66	73	†59	80
Refractive index, N_D^{20}	1.4269	1.4482	1.4234	1.4466	1.4398	1.4190	1.4325	1.4286	1.4276	1.4422	1.4215	1.4474
Liquid analysis, %:												
Olefins	0	23	6	16	21	8	13	14	16	20	0	26
Aromatics	36	54	45	60	46	26	47	41	49	53	39	57
Naphthenes	4	0	8	2	5	12	7	8	4	3	2	0
Paraffins	60	23	41	22	28	54	33	37	31	24	59	17
Gas analysis, mol. %:												
Hydrogen	98.7	91.2	93.4	91.1	89.6	94.0	91.2	91.7	90.5	87.9	97.9	88.9
Olefins	0.2	1.2	1.1	0.6	1.2	1.0	1.8	1.5	2.0	3.1	0.4	0.7
Paraffins	1.1	7.6	5.5	8.3	9.2	5.0	7.0	6.8	7.5	9.0	1.7	10.4

*These catalysts were used interchangeably. †Estimated.

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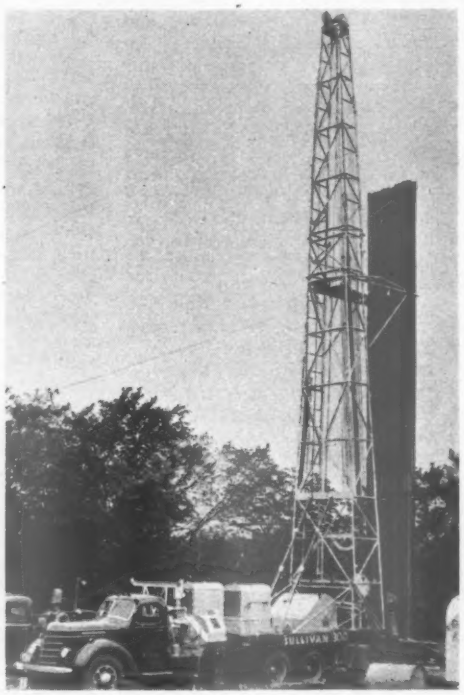

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Writing the ENGINEERING REPORT

by E. H. Short, Jr.

IN discussing the preparation of an engineering report, a few necessary qualifications on the part of the author of the report must be taken for granted. It is presupposed, therefore, that the engineer can spell and construct clear, grammatical sentences. It must also be assumed that he has the subject well enough in hand to write upon it with some authority.

In listing primary qualifications, which may appear rather elementary, no attempt at facetiousness is intended. Chief engineers in several large companies find that they must spend considerable time in editing engineering reports in these respects.

Who Reads Engineering Reports?

Aside from the satisfaction of knowing that a job has been well done, all engineers would like to have their reports "glance read," at least, by those prominent in the management of a company. It is not to be implied that engineering reports must be written for the single purpose of luring executives into reading them from cover to cover, especially where approval of recommendations is not required. Engineering reports serve as records. They also serve as references for engineers working on related subjects. However, all engineering reports which contain recommendations for large expenditures must pass through the hands of the executives.

Engineers, as a group, take justifiable pride in their work. A report often requires weeks to prepare and when it is finally completed—neatly bound, with title and author's name on the front cover—it is understandable that it must be highly regarded by the author, at least.

But what has the author done to assure himself that it will be read? Most executives and department heads already have more to read than they can peruse completely. They are forced to take advantage of all short cuts possible, in order to handle the volume of pressing reading matter which piles up on their desks. It is the job of the report writer to provide the short cuts.

Slant

Assume that an engineer has assembled data and is ready to prepare an engineering report. The first thing he should settle in his own mind is: to whom, or to which particular classification in the company, should the report be slanted?

As an example of slant, a report for the purpose of instructing pumpers along certain mechanical lines should be directed to them. It would be an entirely different type of report from one to the district engineer upon the same subject. A flow of highly technical language to a maintenance or pulling crew, for example, might be almost unintelligible. In cases of this kind, if technical terms are translated into the field man's language, the engineering report is none the less an engineering report—even if fatigued is called "crystallized," tension is called "stretch," and stress per square inch is stated in terms of the number of pounds of pull or push a given piece of equipment will stand.

All reports of any importance pass through executive hands. Many engineering reports contain recommendations involving substantial sums of money. An engineer with imagination and ability can slant a report by simply asking himself what kind of a report he would logically want if he were in the position of a prospective reader. Why not slant the important, approval-requiring engineering reports to the executives?

OUTLINE OF PROCEDURE

I Preliminary Considerations
- A. Slant.
- B. Logical sequence.
- C. Outline.

II The Report
- A. The executive preface.
  1. This report deals with:
  2. Purpose of report.
  3. Recommendations.
  4. Summary.
  5. Conclusions.
- B. The head of the report.
  1. Introduction.
  2. Purpose of investigation.
- C. The main body of the report.
  1. Presentation of problem or project.
  2. Discussion.
     (a) Illustrations and mathematical calculations.
  3. Conclusions.
  4. Recommendations.
  5. Supporting data.
  6. Index.

Logical Sequence

The presentation of various phases of a report and the elaboration of each should be handled by the author so that the reader's knowledge of the report will progress. The logical arrangement or sequence of these various phases of the report will depend somewhat upon the classification in an organization to which a report happens to be directed or slanted. For example, a report may be directed to persons almost as familiar with the subject as the author. In this case it may not be either necessary or advisable to start at a point which a person unfamiliar with the subject might regard as the beginning. It is physically impossible to put the crown block in a derrick before the derrick itself is built. In an engineering report, however, it is possible to suspend an important part of it in midair and build back to whatever might be holding it up in the meantime—much to the confusion of a reader who does not happen to be intimately familiar with the subject. The proper consideration of logical sequence in the preparation of an engineering report depends largely upon well-organized thought processes on the part of the engineer. Then, if the slant has been established, the term logical sequence assumes a more definite proportion.

Outline

Once slant has been determined, an outline which follows a course of logical sequence should be thoughtfully built. The selection of a descriptive title should come first. Many titles of engineering reports are vague, or perhaps misleading as far as the real contents are concerned. The title should be informative, yet terse.

The Executive Preface

The fact that engineers must sell the executives on ideas is becoming

more and more important. Only recently, D. R. Knowlton, PAW director of production, pointed out in an article entitled, "A Challenge to the Petroleum Engineer," that: "the engineer must therefore sell the executive . . . on secondary-recovery programs." He also said that "the engineer's work is only half done when he makes his recommendation, because he must sell his idea or the project is a failure."

The executive preface, therefore, should constitute the first part of all engineering reports. Perhaps all reports do not pass over the executives' desks. Nevertheless, this manner of presentation should be as convenient to any one else. A young engineer, 5 years after a report was written, who happened to be doing research work in the files on a particular subject would thank the engineering author if he, too, could find out about the report in the shortest time possible.

This Reports Deals With:—Even a well-phrased title will probably bring the mental query of "What's this all about?" when an engineering report lands on the desk of a busy executive. While a number of reports originate by special request of some executive, most originate with the engineer.

Therefore, it would be to the writer's advantage, if the prospective reader could turn the cover and find, first of all, on page 1, "This Report Deals With:"—followed by from three to eight double-spaced lines. These lines should explain in clear, direct, terse sentences just what the report is about. It is true that the executive may stop with this first page. However, the engineer's standing will be enhanced to a far greater extent than it would be if the reader has literally to tear the report apart to discover what it is about.

In two instances, at least, an executive might do this very thing: either for the purpose of discovery more reasons than he already has for firing the author, or because a trainee, or junior engineer, is the author. Reports give him an idea of the fledgling's initiative, observational ability, originality and conception of the problems involved in the production of oil.

Purpose of Report.—If the prospective reader is interested in turning to the next page he should find the answer to the question which occurs in logical sequence in any well-organized mental process—why was the report written? Therefore, page 2 should be labeled "Purpose of Report." Even in the most involved types of engineering reports this should be explained in not more than five double-spaced lines. Maybe the engineer is trying to get an appropriation, or perhaps the report was written to cover an investigation or to present a new idea for possible adoption—nevertheless, five double-spaced lines, carefully and deliberately written should be ample.

Recommendations.—Next come the recommendations—the wants of the engineer, based upon his investigation. It is probably true that some engineers would much prefer that the executive would settle back in his chair, thoroughly read the report, and then happen onto the recommendations on the last page. However, the report has probably been read by others who have determined the engineering author knows what he is writing about. Their annotations plus the recommendations, which should appear on page 3, may be all the executive needs. If he needs to know more, he can continue reading.

Summary.—The information needed to justify recommendations can be included in a brief summary. This should be covered in not more than three pages of double-spaced typing—less, if possible. It is important that this is written with the utmost attention to logical sequence, use of ungarnished language and conciseness. Recently a chief engineer mentioned that he had cornered an executive and explained to him briefly the progress of an important work—showing him complicated charts, diagrams and mathematics which substantiated both the theory and actual operation of an important project. The minute the chief engineer paused for breath, the executive broke in with: "That's all very interesting and the charts in various colors make a very nice looking display—but do you suppose that whoever writes the report up could tell at the beginning, in a few words, what has been done up to the present time and what is believed can be done under given conditions—in plain English?"

That particular executive had a successful engineering background, but the press of many other matters did not permit him to keep up, except in a general way, with the ever-changing picture. An engineer should imagine himself in a position where he is beset not only by engineering problems, but also problems pertaining to geology, leasing, drilling personnel, accounting, and at times the pressure of problems involving a wild gas well, or a burning well. If he can get a vivid picture of this kind in mind, he can easily imagine the kind of summary he would want—one which would give him the same conception of the subject that he would like to have if he had not spent days and even months in becoming intimately familiar with it.

Conclusions.—If the report thus far has been handled intelligently and expertly, the reader may see still another card and, if the summary consisted of three pages, turn to page 7. The summary has given him a panoramic view of the whole report and he may wish to see the conclusions. These should be briefed from the ones carried in detail in the latter part of the report. Naturally, all of the material appearing on these first seven pages is written last, after the report has been prepared.

The Head of the Report

Introduction.—If the report is lengthy, single spacing should now be used. However, in short reports, double spacing is generally regarded as good form. It seems to be rather generally agreed that the body of the report should start on page 8, leading off with an introduction.

An introduction may be a review of previous work done along the same line, which leads up to a more detailed explanation of the purpose of the investigation, and the report itself which follows. The introduction has been greatly abused by many writers of engineering reports. More often than not, it is too long, and the most boring, time-wasting introductions start and go on and on with what appears to be a nostalgic reminiscence of how things were done in the past. Wordage, such as "Due to the widely diversified and variegated methods exemplified in the production of oil" . . . and so on for several pages, have been noted in a few engineering reports.

The author must continually bear in mind that it has taken him months to acquire the familiarity he has with the subject and that he is now trying to explain the whole situation to a person who might be totally unfamiliar with it, in a span of time measured in minutes. Logical sequence should again be given careful consideration, and the engineer should again project himself to the same plane of understanding as the reader.

Purpose of the investigation.—This just simply tells why a field, laboratory or research investigation was begun. It is not necessary that this section be very long, and in the most elaborate of reports, a maximum of five double-spaced lines should be sufficient.

The Main Body of the Report

Presentation of problem or project. As far as the engineer himself is concerned, the rough notes he has accumulated during the course of an investigation could be utilized without any particular difficulty on his part. Without sequence, however, his notes would be only a mass of data to anyone unfamiliar with his work. The main body of the report should be planned with the same consideration of logical sequence observed in the first four pages. It is very important that the presentation of the problem covered by the investigation be

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as clear and as informative as possible in the report. Brevity, while desirable at any point in an engineering report, should not interfere with a comprehensive explanation of the problem involved.

Discussion.—At this point in the report the engineer should feel that it is his prerogative to take whatever space is necessary to bring out the results of his investigation. This part of the report should be gradually built up, again with due attention to logical sequence, in such a manner that by the time the reader reaches the conclusions, which follow, his opinion of the whole thing coincides with that of the author. The main body of the report should flow smoothly from beginning to end.

The reader should not be annoyed in the middle of the report by several pages of data which have only a remote bearing upon the discussion. Very often figures are computed from the data and used in the report; however, unless they have an important bearing at the point of insertion, or unless they are helpful to the reader in understanding the report, it seems to be rather well established that such supporting, auxiliary data, or whatever they may be called, should be located at the end of the report. This would place them immediately ahead of the index.

Illustrations and mathematical calculations.—There are charts, graphs, extrapolation of figures to show anticipated future results, mathematical calculations, photographs and diagrams which are vital to a comprehensive report. By careful planning it is often possible to place these illustrations on the page opposite to that page which contains a relating discussion. Where this is possible, it is good practice. Some engineering reports appear to have been written for the purpose of challenging the ability of the reader to find the charts, pictures, etc., referred to in the body of the report.

The facing-page arrangement will require more time, of course, than plugging illustrations into a report in what appears to be a random fashion. If a reader is actually trying to understand a report, it is frequently necessary for him to glance from the discussion to the illustration, and if it is on the opposite page during most of the discussion at least, the convenience to the reader is obvious.

Conclusions — Recommendations — Supporting data — Index.—The conclusions and recommendations should be covered quite thoroughly at this point, in whatever detail the author believes to be necessary. It will be recalled that these were briefed in the executive preface portion of the report.

Types of Reports

It may be contended that each report should follow a different plan of preparatory procedure. Perhaps some reports should follow a different one; however, it has been observed that reports which fall in the classifications listed below might follow the procedure outlined—to an advantage for both the author and the reader:

1. The advancement of a new idea.
2. The results of laboratory, field or research work or investigation.
3. Recommendations for expenditure on new projects.
4. Executive request for a special investigation.
5. Operations in general.
6. Progress of certain engineering work.
7. Comparisons of various types of equipment.
8. Test results of various types of equipment.

There are two types of engineering reports which have been subjected to a great deal of unfavorable comment by key men and executives in the oil industry. These reports have no place in the above list, and yet should be briefly mentioned. One type would be "Reports which lack sufficient merit and should never have been written," and the other might be called "Personal advertising engineering reports."

Alkylation and Isomerization Plant

(Continued from Page 89)

balance out total production of C_4 olefins.

A number of thermal cracking units of the coke-in-place type are operated as well as a thermal reforming unit charging naphtha. All gas and distillate produced passes through a common stabilizer plant. This was formerly operated to produce among other things a C_3-C_4 cut used as feed stock for a thermal polymerization unit. In revising facilities, the polymerization unit was shut down and additional fractionation added to produce a relatively pure B-B cut. This fraction containing butenes, isobutylene, isobutane, and normal butane serves as the principal feed stock for the alkylate plant.

Debutanizer Column

Normal butane and isobutane are separated from depropanized straightrun gasoline in a straightrun gasoline debutanizer column. This B-B fraction serves as a second source of feed stock. The debutanized straightrun gasoline then passes to a deisopentanizer column where isopentane is recovered as a blending stock for the production of 100-octane number gasoline.

In operating the alkylation process, a B-B fraction from the cracked-gasoline debutanizer containing C_4 olefins and isobutane is caustic washed, passed through a water settler and introduced into the reactors. The butane-isobutane mixture from straightrun gasoline, butane-isobutane mixture from the isomerization unit and alkylate effluent are charged into an isobutane tower. The overhead isobutane is mixed with the sulfuric acid catalyst and introduced into the reactor where the reaction between olefin and isobutane takes place forming alkylate. Some unreacted material and propane product go overhead to a column where the propane product is removed and the bottoms are recycled to the reactors.

The alkylate effluent from the reactors is caustic washed and passed to a tower for deisobutanizing. From this column it passes to a debutanizer and then to a rerun tower where aviation alkylate is stripped of a small amount of heavy alkylate.

Yield of Alkylate

Various factors influence yield and quality of aviation alkylate. Reactor temperature, time, external ratio of isobutane to olefin, internal ratio of isobutane to olefin, ratio of hydrocarbon to acid and other process variables can affect final result. The design of the unit is such as to provide liberally for these factors insuring maximum yields of high-octane alkylate from the olefin feed stock available.

Operation of the isomerization unit is regulated to make up the isobutane deficiency. The feed stock for this section is butane recovered from the alkylate debutanizer. The butane is heated, dried and passed through the catalyst bed. About 40 per cent conversion of butane to isobutane takes place per pass. The butane-isobutane mixture containing HCl goes to the HCl stripper where this material is removed and returned to the feed stream inlet. The butane-isobutane mixture is caustic washed and returned to the isobutane tower.

The isomerization process is a vapor-phase type using aluminum chloride deposited on a Porocel bed as a catalyst. HCl gas is circulated through the bed along with the butane and serves to promote catalytic activity. There are two catalyst cases so that one bed can be prepared while the other is on stream.

Sufficient flexibility is provided in the isomerization section to permit making whatever isobutane is required to balance the C_4 olefins. The alkylation section is likewise designed to handle peak production of the available olefin feed. Every effort is being made to operate the facility for the maximum production of aviation alkylate, now most urgently needed in the national program for 100-octane number aviation gasoline.

Pour-Point Stability of Treated Oils Under Winter Storage Conditions

by Caleb E. Hodges and A. Bruce Boehm†*

Instability in pour points of pour-point-depressant-treated winter oils is a phenomenon encountered frequently; in storage such oils will sometimes solidify at temperatures above their test-determined pour points.

A new test method for studying this property of oil blends starts with a cycle of temperature changes, ranging from, say, —30° to 30° F., the temperature being raised and lowered on a regular cycle, dropping the top temperature 10° in each succeeding cycle until the solidifying temperature is found. A relationship exists between the degree of dewaxing and the pour-point stability of oils, the authors find.

SOME years ago the fact became known that during the winter months certain pour depressant treated motor oils were sometimes found solid in their storage containers at temperatures higher than those indicated by their A.S.T.M. pour points. This is referred to as "pour reversion." For example: a 10-W motor oil made from a neutral-bright stock blend and Paraflow had an A.S.T.M. pour point of —20°. The oil was found solid during winter storage at about 10°.

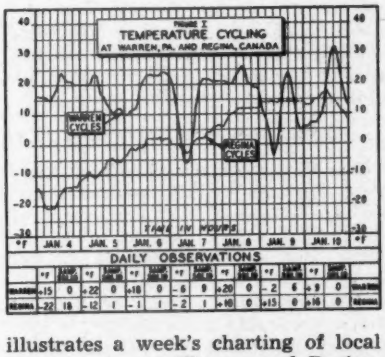
This phenomenon seemed to be due to certain critical temperature changes which the oils sometimes underwent during cold weather storage.

Failures of Paraflow treated oils in service due to pour reversion either have not occurred or have not been reported. Reversion is of interest therefore largely because of its troublesome effects on dispensing the oil and the bad impression it may create with dealers and consumers. A program was designed, therefore, to thoroughly investigate this problem.

Field Tests

For the past several years the Paraflow Laboratories have been conducting field and laboratory studies of extended low temperature storage of Paraflow treated oils to determine the factors that control pour point stability. During the three winters from 1938 to 1941, oil samples were placed in sets for observation in three different locations, one in this country and two in Canada. Regina and Montreal in Canada and Warren, Pa., were chosen for their difference in temperature levels.

The average winter temperature at Warren was 20° F. and the lowest temperature reached was —7°. For Montreal, the average temperature was 15° F. and the lowest temperature reached —12°. At Regina the average was 10° F. and a low of —22° was recorded. Similar samples were sent to each place and were stored in protected outdoor racks. They were examined daily for fluidity characteristics and temperatures were recorded continuously 24 hours a day. Fig. 1



illustrates a week's charting of local temperatures at Warren and Regina. One hundred different oil blends were tested at each location and from this work some rather startling trends were discovered. Evidence pointed to the fact that A.S.T.M. pour point was often no indication of an oil's behavior in the field. The data in Table 1 illustrate that field results were both higher and lower than the A.S.T.M. pour procedures indicate.

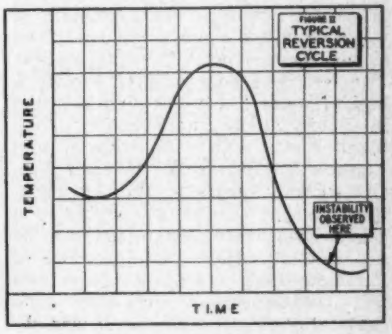
The field data was then correlated in an effort to determine the principal temperature fluctuations associated with pour point instability. Although the data were irregular, certain trends could be distinguished. For a given unstable oil, pour instability generally occurred under a definite pattern of temperature fluctuation.

TABLE I

Sample—	A.S.T.M. solid point*	Highest field solid point
A	—25° F.	—27° F.
B	—25° F.	—6° F.
C	—25° F.	+2° F.
D	—30° F.	+2° F.
E	—10° F.	—22° F.

*A.S.T.M. solid point is 5° lower than the A.S.T.M. pour point.

The highest solid points in the field test usually occurred after the samples underwent a temperature cycle such as the one in Fig. 2 which starts



at a temperature below the cloud point of the oil and includes a steep warming section followed by a sharp drop in temperature. Fig. 1 shows a cycle of this type which occurred at Warren, Pa., on January 6 and January 7. Observations on sample fluidity were made at 8:30 a.m. and this was the first day of the test in which reversion was observed. The samples had been exposed to outdoor temperature conditions for 13 days. This type of cycle occurred most often at Warren, Pa., and although average temperatures at Montreal and Regina were lower, higher and more frequent solid points were observed at Warren.

Theoretical Discussion

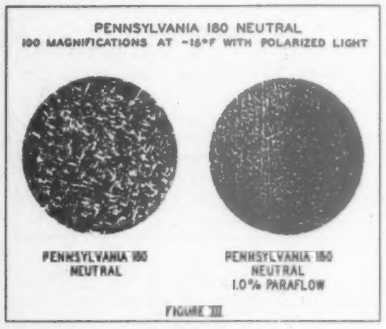
In order to explain why a temperature cycle such as the one illustrated above causes instability, a brief discussion of the phenomenon is pre-

*Paraflow Laboratories, Standard Oil Co. of New Jersey.

†Chemical Products Dept., Stanco Distributors, Inc.

This paper was presented before the Oil City and Bradford, Pa., meetings of the National Petroleum Association and the Tulsa meeting of the Western Petroleum Refiners Association.

sented based on adsorption chemistry. The solid point of a wax bearing oil is much higher, due to the presence of wax, than would be expected on a basis of reduced fluidity with lowered temperature. This is due to the formation of a wax-oil gel. Anything that would block the formation of this gel would as a result lower the temperature of solidification. Paraflow appears to do just that. Paraflow has a powerful effect on crystallization of paraffin wax from oil. The photomicrographs in Fig. 3 prepared by


PENNSYLVANIA 180 NEUTRAL
100 MAGNIFICATIONS AT -15°F WITH POLARIZED LIGHT
PENNSYLVANIA 180 NEUTRAL
PENNSYLVANIA 180 NEUTRAL 1.0% PARAFLOW
FIGURE III

Bartlett[1] show that Paraflow markedly changes the size and shape of the crystals. This is accomplished through selective adsorption of Paraflow by minute wax crystals. Instead of the wax crystals growing and adsorbing oil which results in the formation of a gel, Paraflow coats the crystals and in this manner inhibits gel formation. The fact that wax adsorbs Paraflow in preference to oil was demonstrated by Davis, Zimmer and Frolich.[2] They blended wax with a wax-free oil and vacuum filtered at 32° F. both with and without Paraflow. With no Paraflow present the filtration yielded a gel-like wax mat containing 30 to 50 per cent oil, while in the presence of Paraflow there was not gel formation and a comparatively dry wax cake containing only 5 per cent oil was obtained, showing the extent to which Paraflow prevented the adsorption of oil by the wax.

Further evidence that the attraction between Paraflow and wax is a phenomenon of adsorption also was shown by Davis and Zimmer. They blended wax and Paraflow with a solvent naphtha. These blends were filtered at 0° F., and the distribution of Paraflow between the wax and the solvent was calculated. By plotting this distribution for several concentrations of Paraflow a typical adsorption isotherm was obtained (Fig. 4). The foregoing evidence gives a clear basis for the use of adsorption chemistry in explaining this problem. It follows that in a Paraflow waxy-oil blend, a wax-oil gel formation is prevented or delayed by a coating of Paraflow on the wax crystals. If, however, some force is brought to bear on the Paraflow coated wax particles which causes the release of the adsorbed Paraflow, the wax crystals will be left free to flow and absorb oil or, in other words, to form a gel. Once oil is adsorbed on the wax the return of Paraflow to the wax particle is blocked. This is demonstrated by blending oil and Paraflow above and below the cloud point of the oil. Regular blending at about 100° F. of 1 per cent Paraflow in a +30° F. cloud oil gives about —20° A.S.T.M. pour point, while the same components blended at +25° give a +20° A.S.T.M. pour point. In the latter case wax is already out of solution and has absorbed oil. This seems to have blocked the adsorption of Paraflow and resulted in a high pour point.

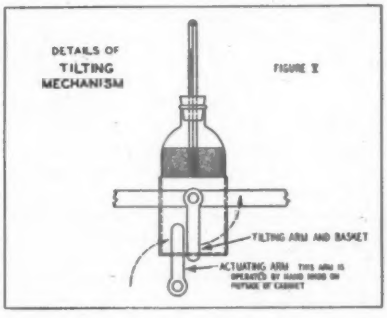
A force to remove the Paraflow coating from the wax crystals may be found in the temperature fluctuations illustrated in Fig. 2. Under these conditions a Paraflow treated oil is at a temperature well below its cloud point and in a state where the wax particles are well inhibited by Paraflow. The oil is subjected to a sudden warming. Immediately the adsorption equilibrium between absorbed Paraflow and Paraflow in solution is displaced and some Paraflow leaves the wax crystals and goes into solution in order to reach equilibrium conditions at the new higher temperature. Paraflow redissolves in oil more quickly than does wax or in other words it actually takes considerably longer for the wax to go back into solution than it does for Paraflow which had coated the crystals. The above action leaves part of the wax free to adsorb oil, and as the blend is cooled again the adsorbed oil blocks the return of the Paraflow to the freed wax crystals. The resulting solid point is consequently higher than it was before going through such a temperature cycle.

Laboratory Test Developed

Not all oils turned solid in the field tests, however. Other variables such as type of oil and amount of pour depressant were found to be important. But the field data were not complete. Since the field test required 3 months to complete, a year's work was spent in developing a laboratory procedure to take its place. The field test temperature data were used as an aid in determining the temperature cycles for the laboratory tests and the field samples were run in the laboratory tests for control. The laboratory procedure that was finally accepted yielded results in which over 90 per cent of the samples run correlated satisfactorily with the field test results. This test, described specifically in following paragraphs, was accepted as the best procedure so far developed for predicting the performance of a pour depressant treated oil under winter storage and is known as the stable pour procedure.

Stable Pour Procedure

The stable pour procedure is carried out in an insulated cabinet equipped with a mechanical refrigeration system and an automatic temperature controller. The cabinet can accommodate 16 quart samples at one time and they are set in movable racks which can be operated from the outside in such a manner that samples can be tilted separately to 45° when examined for oil flow (Fig. 5). Observations are made through a window that extends the full length of the cabinet.



The temperature of the cabinet is controlled by an electrical time-temperature controller. This controller governs the operation of the heating and refrigeration units and is calibrated so that when an actuating arm follows the contour of a slowly rotating cam (the same being graduated in degrees F.) the temperature of the cabinet will conform to that indicated by the position of the arm on the cam.

Fig. 6 is a graph of the temperature cycles used in the stable pour pro-

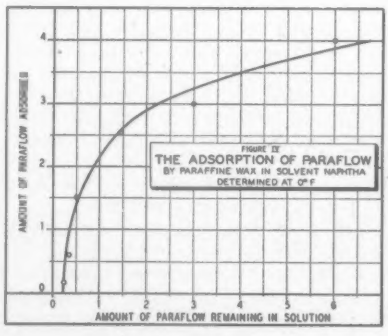
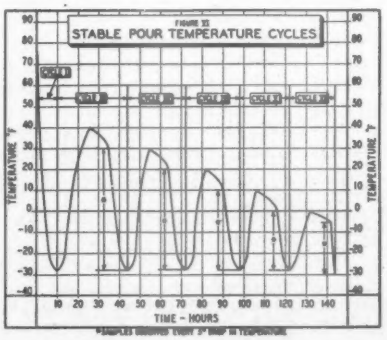


FIGURE IV
THE ADSORPTION OF PARAFLOW
BY PARAFFINE WAX IN SOLVENT NAPHTHA
DETERMINED AT 0°F
AMOUNT OF PARAFLOW ADSORBED
AMOUNT OF PARAFLOW REMAINING IN SOLUTION



cedure, which are found to be over 90 per cent effective in reproducing the pour performance of field samples. Samples are observed on the sharp down cycles beginning with Cycle II at +30°, Cycle III at +20°, Cycle IV at +10°, etc. The samples are tilted every 5° and their temperatures and fluidity recorded. At the conclusion of the test the highest temperature at which the oil sample was found solid is noted and 5° is added to this temperature for reporting the stable pour point. If a sample does not go solid in the stable pour procedure, the lowest observed temperature of that sample is recorded and the stable pour is reported as below that temperature. For example, oils X and Y were observed during the stable pour procedure according to Table 2.

Table 2

Solid Temperatures From Stable Pour Procedure

	Oil X	Oil Y
Cycle II	Below —28	Below —28
Cycle III	Zero	Below —28
Cycle IV	+5	Below —28
Cycle V	—5	Below —28
Cycle VI	—10	Below —28
Stable pour	+10	Below —28

The stable pour point of oil X would be reported as +10 F. while that of oil Y would be reported as below —28°.

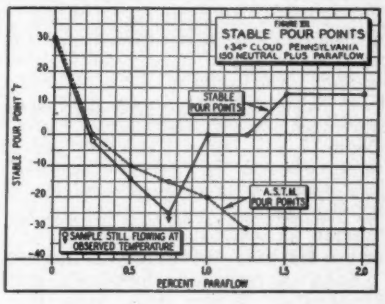
Pour Stability Studies

As mentioned before, pour reversion of pour depressant treated oils depends on critical temperature cycles during storage. The susceptibility of oils to these temperature cycles and the extent to which pour reversion may occur are functions of the oil composition. Using the laboratory procedure for determining stable pour, intensive studies are being carried out to discover the various factors of oil type and composition which are important in pour stability. Preliminary work indicates several factors which appear to exert a definite influence. These include type of neutral or bright stock use, relative amounts of each, extent of wax removal or wax content of stock, and amount of pour depressant used.

Since most pour instability problems have been experienced with the lighter grades of motor oils, our stability work has been confined to these oils and their components. They are mainly S.A.E. 10 and 20 oils of relatively high paraffin wax content which require a pour depressant in order to meet A.S.T.M. pour specifications.

Pour Stability of Neutrals Plus Paraflow

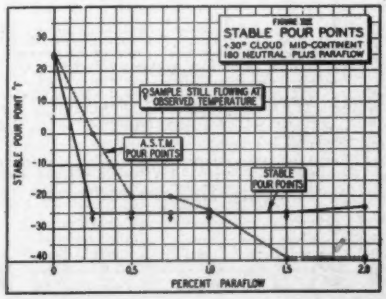
Although progress has been made, the data acquired to date serve chiefly to emphasize the complexity of the problem and to indicate how some of the factors referred to may influence the problem. Since we are dealing with petroleum fractions which are mixtures of large numbers of compounds, there are many variable involved. This fact makes it difficult to correlate pour stability results with any broad oil classification. For instance, whereas all waxy neutrals respond well to Paraflow treatment, each different neutral oil used must be tested with several concentrations of Paraflow in order to determine the correct amount of depressant to give the most stable blend. The higher concentrations of pour depressant do not necessarily give the more stable blends and as stated previously, there is often little correlation between A.S.T.M. pour and the stable pour of an oil-pour depressant blend. With the use of straight neutrals and Paraflow there is generally a limited range of Paraflow concentration which will yield satisfactory pour stability. The definition of a satisfactory stable pour has been established by experience. Generally, if an oil has a stable pour of about —10° F. or lower, there is no unsatisfactory field experience reported. Thus, if an oil has a stable pour of —10° or lower by the laboratory procedure, it is classed as "satisfactory." Too much or too little depressant results in unsatisfactory stability. This is illustrated by the stable pour points of a series of blends made with Pennsylvania 150 neutral and several concentrations of Paraflow (Fig. 7). Some neutrals, however, may have excellent pour stability with a wide range of pour depressant concentration (Fig. 8) and there are also those which seem to be resistant to all reasonable amounts of pour depressant (Fig. 9).

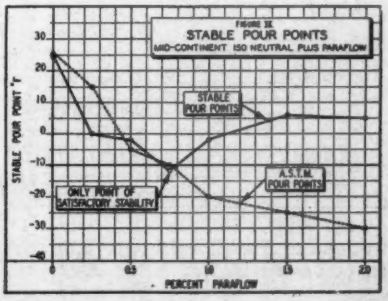

STABLE POUR POINTS
+34° CLOUD PENNSYLVANIA 150 NEUTRAL PLUS PARAFLOW
STABLE POUR POINTS
A.S.T.M. POUR POINTS
SAMPLE STILL FLOWING AT OBSERVED TEMPERATURE
STABLE POUR POINT °F
PERCENT PARAFLOW

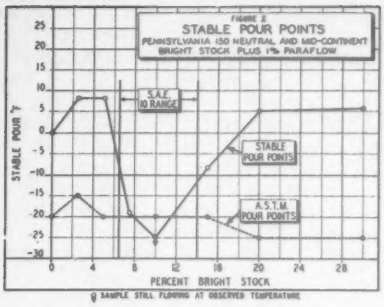
Presence of Bright Stock in Neutral-Paraflow Blend

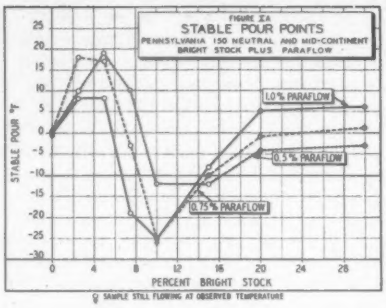
Recently it became known that the inclusion of bright stock in a neutral oil-Paraflow blend may radically change the pour stability characteristics of the resultant oil. The small amounts of bright stock used with light neutrals to make 10-W oils often seemed to yield oils of doubtful stability. To check this observation, a series of blends were tested consisting of Pennsylvania 150 neutral, 1 per cent Paraflow, and a Mid-Continent bright stock in concentrations ranging from 2.5 per cent to 30.0 per cent. These data are the results of only preliminary work, but they express the important role played in pour stability not only by the presence of bright stock in an oil blend, but also by the percentage used. Stable pour points range from +8° to below —25° depending on the concentration of bright stock present in the blend (Fig. 10). Satisfactory stability was obtained with from 7 to 15 per cent bright stock content. Fig. 10-A shows the same series of neutral bright stock blends but each curve represents a different Paraflow content, so that this figure relates the two variables, bright stock and pour depressant. Fig. 10-B shows the effect of varying bright stock concentration in Pennsylvania 150 neutral Pennsylvania bright stock blends plus 1 per cent Paraflow and Fig. 10-D indicates the variations caused by using three different types of bright stock with 150 Pennsylvania neutral.

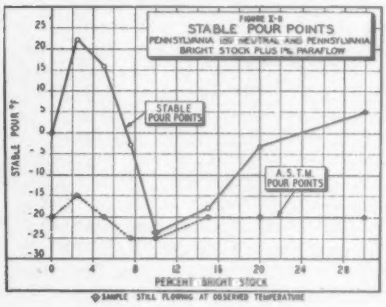
A similar series of blends was made using Pennsylvania 180 neutral, Pennsylvania bright stock, and 1.0 per cent Paraflow. Variation of the bright stock proportion again had a marked effect on stability but satisfactory stability was achieved only with the smaller amounts of bright stock (Fig. 11). The curve indicates satisfactory stability between about 2 and 9 per cent bright stock. Other bright stocks and neutrals are being tested with Paraflow for pour stability using various combinations and ratios of each stock. The results of this work

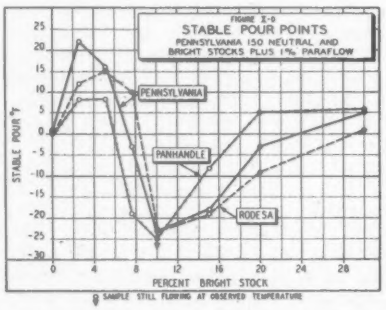

STABLE POUR POINTS
+30° CLOUD MID-CONTINENT 180 NEUTRAL PLUS PARAFLOW
SAMPLE STILL FLOWING AT OBSERVED TEMPERATURE
A.S.T.M. POUR POINTS
STABLE POUR POINTS
STABLE POUR POINT °F
PERCENT PARAFLOW

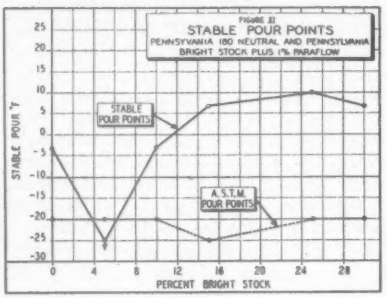



STABLE POUR POINTS
PENNSYLVANIA 150 NEUTRAL AND MID-CONTINENT BRIGHT STOCK PLUS 1% PARAFLOW
S.A.E. 10 RANGE
STABLE POUR POINTS
A.S.T.M. POUR POINTS
STABLE POUR °F
PERCENT BRIGHT STOCK
SAMPLE STILL FLOWING AT OBSERVED TEMPERATURE




STABLE POUR POINTS
PENNSYLVANIA 150 NEUTRAL AND PENNSYLVANIA BRIGHT STOCK PLUS 1% PARAFLOW
STABLE POUR POINTS
A.S.T.M. POUR POINTS
STABLE POUR °F
PERCENT BRIGHT STOCK
SAMPLE STILL FLOWING AT OBSERVED TEMPERATURE




STABLE POUR POINTS
PENNSYLVANIA 150 NEUTRAL AND PENNSYLVANIA BRIGHT STOCK PLUS 1% PARAFLOW
STABLE POUR POINTS
A.S.T.M. POUR POINTS
STABLE POUR °F
PERCENT BRIGHT STOCK

will be published at a later date.

Although the above data are only general and preliminary, they form a working basis for helping the refiner select the correct proportions of base stocks to make a motor oil of satisfactory stability.

Effect of Dewaxing on Pour Stability

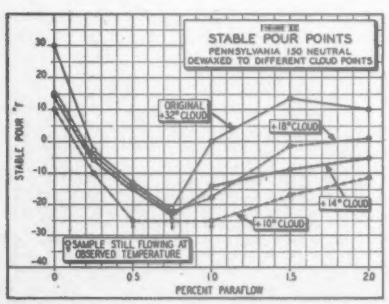
Should conditions arise in attacking a pour stability problem where no satisfactory solution is found by testing different ratios of the base stocks concerned, or where a solution, if found, may not be feasible or economical, it would then be desirable to know what effect further dewaxing these stocks would have on pour stability.

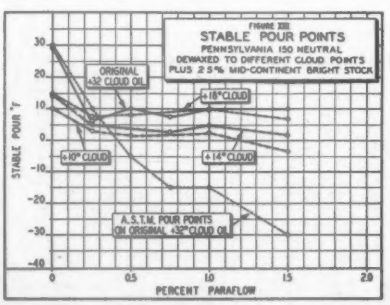
With this in mind several portions of the +32° cloud Pennsylvania 150 neutral were solvent dewaxed to three different cloud point levels, +18°, +14° and +10°. Paraflow was added and blends tested for pour stability. Fig. 12 shows that for small concentrations of Paraflow (up to 0.75 per cent) dewaxing had little effect on stability until a +10° cloud was reached. For larger amounts of Paraflow (0.75 to 2.0 per cent) good improvement was noticed in all three cloud levels. Since stability with small amounts of Paraflow was already good in the original +32° cloud oil, the fact that improvement by dewaxing showed up principally with larger amounts of Paraflow is logical.

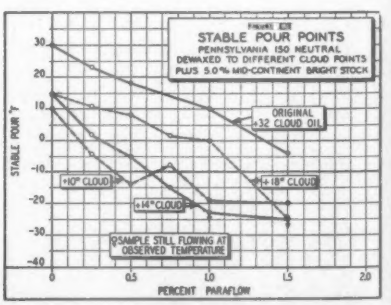
Knowing that the inclusion of small amounts of bright stock with this Pennsylvania 150 neutral tends to give unsatisfactory stability, 2.5 and 5.0 per cent Mid-Continent bright stock were blended into the dewaxed oils. Fig. 13 pictures the stability results obtained with the dewaxed samples and 2.5 per cent bright stock. They are somewhat irregular, but it is apparent that the stability of these blends is still unsatisfactory. Fig. 14 shows the stability results obtained with the dewaxed samples and 5 per cent bright stock. In contrast to the blends with 2.5 per cent bright stock a good improvement over the original oil plus bright stock is noted immediately, and satisfactory stability is secured with the +14° and +10° cloud oils over a fairly wide range of Paraflow concentration.

Although further dewaxing the neutral base stock may not completely clear up the instability problem, it appears to widen the range of bright stock concentration which will yield good stability. Secondly, dewaxing combined with Paraflow treatment may offer the refiner a means of obtaining satisfactory pour point stability with certain neutrals or combinations of neutrals and bright stocks which otherwise show consistently unsatisfactory results.

The data in this paper are not given for the purpose of indicating proper or safe formulations but to suggest some of the pitfalls encountered in the compounding of winter grade oils. We would also like to indicate that we may be of service to the users of Paraflow in running stability tests on their proposed formulations. This can be done to a limited extent as space in our stability test equipment permits.




STABLE POUR POINTS
PENNSYLVANIA 150 NEUTRAL DEWAXED TO DIFFERENT CLOUD POINTS PLUS 2.5% MID-CONTINENT BRIGHT STOCK
ORIGINAL +32 CLOUD OIL
+18° CLOUD
+10° CLOUD
+14° CLOUD
A.S.T.M. POUR POINTS ON ORIGINAL +32° CLOUD OIL
STABLE POUR °F
PERCENT PARAFLOW


STABLE POUR POINTS
PENNSYLVANIA 150 NEUTRAL DEWAXED TO DIFFERENT CLOUD POINTS PLUS 5.0% MID-CONTINENT BRIGHT STOCK
ORIGINAL +32 CLOUD OIL
+10° CLOUD
+18° CLOUD
+14° CLOUD
SAMPLE STILL FLOWING AT OBSERVED TEMPERATURE
STABLE POUR °F
PERCENT PARAFLOW

Acknowledgment

The advice and assistance of E. Lieber, M. M. Sadlon, and R. L. Radcliffe, Jr., during the course of this work is greatly appreciated.

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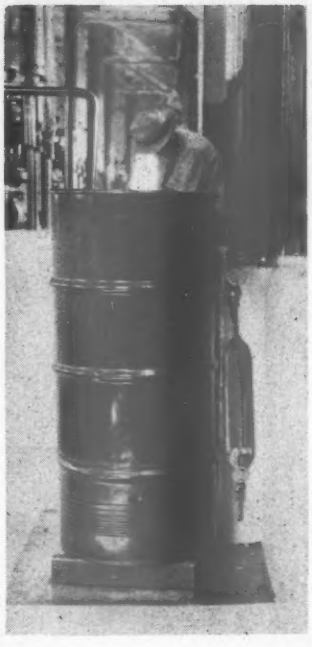
PLANT PRACTICES

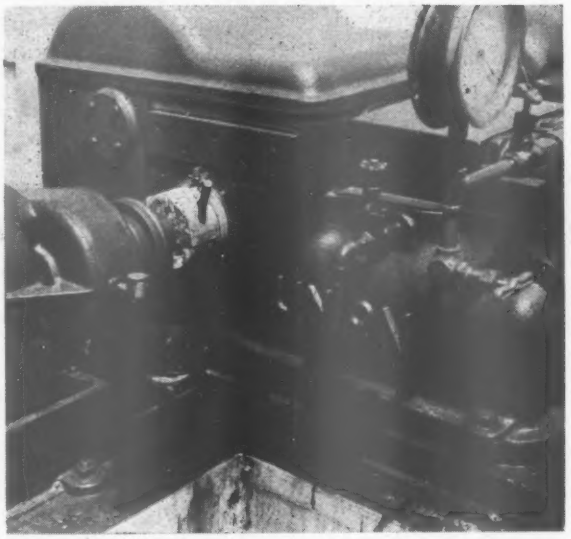


Reclaiming Unit for Excess Gas-Engine Oil →

SUBSTANTIAL economies in lubricating oil are made possible in one large gasoline plant by reclaiming the excess oil that drains from the crankshafts of the gas engines and also the oil that leaks from the stuffing boxes. This oil which ordinarily might be wasted is collected by means of 1-in. drain lines from the crankcases of the various engines to a common header, a 1-in. line that leads with gravity flow to a filter. The filter, shown in the picture, was made from sections of two oil drums welded end to end with the top of the lower section and the bottom of the upper section cut out to form a single container. The filtering unit consists of an inner container about 18-in. high which fits down inside the shell of the oil drums resting on a couple of cross-straps placed about the midpoint on the inside of the shell. The bottom of the filtering unit is wire screening. Several layers of burlap are placed on the screen bottom and then the container is filled with ordinary fire clay, through which the oil is filtered, draining through the screen bottom to the drum shell below. The filter removes any dirt or foreign matter that might have contaminated the oil in the engines. The 1-in. oil line entering the filter has a small water leg on the outside, into the bottom of which water in the oil settles and is drained off. This was made from a short section of 4-in. pipe swaged to 1-in. inlet and outlet openings by "orange peel" cuts and welds. The oil reclaimed amounts to approximately 1 qt. per day per engine.

Oil Accumulator for Pump Stuffing Box Leakage →

ON most all circulating pumps a certain amount of oil seeps out through the drive-shaft stuffing box. When the pumps are located in the open, the wind may blow the drippings, spraying the oil over the pump and making it difficult to keep the pump clean. The operator of one plant has overcome this difficulty by a small housing that fits snugly against the pump casing, enclosing the stuffing box outlet and the drive shaft as it enters the stuffing box. The housing was constructed of sheet tin shaped around the shaft. The leakage oil accumulates in the bottom of the housing, which is fitted with a small drain on the underside for drawing off the oil when desired.



←Extension Shafts for Control of Compressor Suction Line Valves

VALVES on the gas suction lines to the compressors in a Kansas gasoline plant are operated by means of control-shaft extensions that place the turning wheels at a convenient height above the floor. The lines enter the compressor plant building below the level of the floor. Without the shaft extensions, the control wheels on the valves also would be below the floor level and access to them would not be possible without removal of the floor grating which covers the pits through which the lines enter. The shaft extensions were made from sections of 2-in. pipe, welded to the valve stems after the control wheels had been removed. The wheels then were fitted and keyed to the top ends of the pipe extensions. The upper ends of the shafts are supported and held in position by means of strips of metal plate fastened between two pressure-control lines and through which the shafts turn.

Sulfur Removal From Sour Crudes Reduces Corrosion, Improves Product Quality

by Arch L. Foster

Both preliminary and intermediate neutralization of corrosive elements in sour crudes are necessary for successful processing of these crudes. Processing sour crudes may become necessary for many refiners who have heretofore refined only sweet crudes. More than a dozen processes are available for sweetening sour-crude products, and for reduction of sulfur content, including processes for converting mercaptans to disulfides, solvent extraction of sulfur compounds and catalytic desulfurization. The last two process types are most useful, improving octane number and TEL response.

TREATMENT of high-sulfur crude oils divides into two phases—pretreatment of the crude itself before and during primary processing, such as distillation; and treatment of raw products. Primary purpose of the first treatment is to reduce corrosion of refinery equipment and to lessen personnel hazards in the plant due to the injurious nature of sulfur compounds, especially hydrogen sulfide.

The main reason for desulfurization of products from sour crudes is to improve their qualities which are important commercially — octane number, odor and corrosiveness of gasoline, odor and burning qualities of kerosene, etc. Response of gasolines to octane number improvement by the addition of tetraethyl lead (TEL) is one of the most important considerations.

Desulfurizing Crudes

Desulfurization of crudes, as such and for that purpose alone, seldom if ever is carried out as a routine operation. Rather, neutralizers are employed to reduce or eliminate corrosion due to sulfur or its compounds. This neutralization may take place before the introduction of the crude into plant operations—stills, desalters, etc.—or the neutralizing chemical may be added before entrance to the primary still and may continue through the distillation step with the crude. In the case of much H_2S present in the crude, a wash with caustic soda, soda ash, lime, or ammonia solutions may be given. The qauntity of reagent required to neutralize is determined beforehand by test and treatment is so controlled. In some cases a crude neutralized at low temperature may become corrosive at elevated temperatures and a second reagent addition might be required. This is usually added to the stream just before the point is reached in its flow where corrosion occurs and may be the same reagent as that employed in the first treatment, or may be a different one.

Three chemicals are most commonly used to neutralize corrosive products—sulfur or otherwise—in crudes; caustic soda or soda ash, lime, and ammonia. Each has its specific advantages and disadvantages, and each is used under conditions where it gives the best results over all. Caustic soda has the advantage that it is soluble in water to form very concentrated solutions, it is relatively cheap, widely obtainable and its use and effects are thoroughly understood through long experience. Its chief disadvantages are that it may cause embrittlement of steels with resultant failure of equipment; it may form bad emulsions of crude and water in cases where concentrated solutions are used and where the wash solution is to be separated from the crude prior to further processing.

Lime is cheaper than caustic, reacts more slowly, must be handled as a slurry if concentration of reagent greater than the low solubility of lime in water is required. Lime slurry is generally added to the crude prior to distillation, and the lime is carried through heating coils and into flash chambers or towers. It finally is suspended in the heavy residuum, as is caustic so handled, and both complicate the matter of residual fuel oil specifications, as to total solids percentage.

Ammonia is highly desirable and used widely where relatively low temperatures are found, can be added as liquid ammonia without more than traces of water. Ammonium compounds decompose under such elevated temperatures as are used in distillation and are used therefore in fractionating towers, heat exchangers, condensers, etc.

Corrosiveness of sulfur compounds varies widely. Marks[2] considers mercaptans the most corrosive of the sulfur products, H_2S as "highly corrosive"; free sulfur is corrosive but less so than the first two, while other sulfur organic compounds are only slightly corrosive under most refining conditions. Marks also states that free sulfur and H_2S are only mildly corrosive below 500° F., but both are quite reactive at 700° F. and above. Caustic soda reacts more rapidly with mercaptans and H_2S than does lime; ammonia also reacts rapidly, but ammonium sulfide so formed dissociates easily at temperatures below that of distillation. Caustic embrittlement is a serious potential hazard, and is said to be caused by reaction of caustic with the impurities deposited at the crystal boundaries of the steel and thus weakening its tensile strength.

Handling a high sulfur crude, especially one which contains appreciable quantities of H_2S, is a specialized though not involved procedure. Not the least of the hazards is that of danger to personnel especially from the deadly H_2S gas. This phase of handling such crudes will be taken up in the second article of this series.

Treating Methods for High Sulfur Distillates

Sulfur compounds are undesirable in petroleum products, especially gasoline and burning oils—kerosene, range oils, etc.—because:

In gasoline:

1. The octane number is lowered;
2. TEL response is lowered appreciably and expensively;
3. Corrosiveness of the gasoline may be serious;
4. Odor is highly objectionable;
5. Color and gum stability are generally poor.

In kerosene:

1. Smoking and wick deposits are bad;
2. Odor is bad to worse;
3. Corrosiveness is poor to bad;
4. Color stability is poor.

The chief offender sulfur compounds in gasoline are:

1. H_2S, either present in the crude and thus in straightrun gasoline fractions, or formed during cracking operations;
2. Mercaptans of molecular formula RSH, where R represents an organic radical;
3. Organic disulfides and polysul-

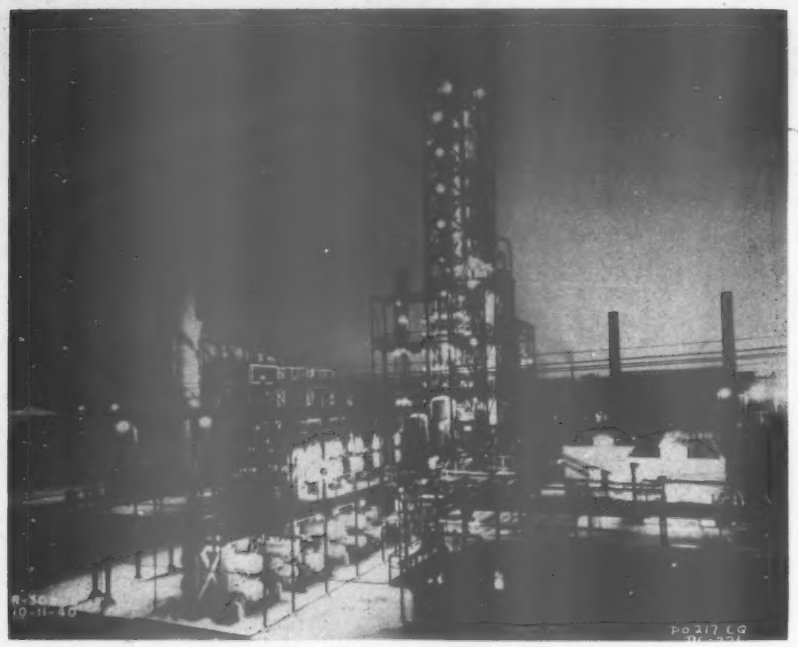


Photo courtesy Foster Wheeler Corp.

Exigencies of warfare make continued operation of war product refineries imperative. Consumption of sour crudes will probably increase

fides, of which the tetrasulfides are probably the most undesirable;

4. Cyclic sulfur compounds, as thiophene.

Until recent years gasoline sweetening was the treatment most employed, for the purpose of eliminating bad odors, of meeting sulfur specifications of the federal Government, the several states and individual buyers. Later it was found that reduction of total sulfur, especially of mercaptan sulfur and H_2S, not only improved the clear octane number of gasoline by one to three numbers or more, but also increased appreciably the TEL response. Later process developments have been in the direction of reduction of total sulfur and the elimination of the disulfides which in doctor sweetening and similar processes remain in the gasoline and injure its octane-rating proclivities.

Treating processes, for the purposes of this article, will be divided into two groups, those which sweeten the gasoline or change the corrosiveness, etc., of the kerosene, without necessarily reducing or eliminating sulfur, and those which remove sulfur as their primary purpose. These two groups include the three groups into which Happel, Cauley and Kelly[28] divide these processes; there may be some question as to which of the two some of these processes should belong.

Sweetening processes include:

1. Doctor treating.
2. Lead sulfide treating (analogous to doctor treating).
3. Hypochlorite treating.
4. Copper chloride—solid and liquid processes.

Desulfurization processes, whether effective against only certain types of sulfur compounds or against any sulfur materials, include those which remove sulfur by essentially solvent action:

1. Caustic scrubbing.
2. Solutizer process (Shell).
3. Unisol process (caustic-methanol).
4. Sulfuric acid, which changes mercaptans to disulfides, which are soluble in the acid.

Another desulfurization route is the catalytic:

1. Gray process, fuller's earth, or clay).
2. Schulze or Perco process (bauxite).
3. Houdry catalytic treating.

Volumes have been written about the doctor sweetening reaction and processes to accomplish it. The reaction is:[5]

$$2RSH + Na_2PbO_2 = \begin{matrix} RS \\ RS \end{matrix} > Pb + 2NaOH$$

$$\begin{matrix} RS \\ RS \end{matrix} > Pb + \tfrac{1}{2}S_2 = RSSR + PbS$$

Disulfide

In the doctor sweetening process, lead oxide, PbO is dissolved in Na_2CO_3 solution to form the sodium plumbite, which reacts with the mercaptans, RSH, when brought into contact with the sour gasoline, dehydrogenating the mercaptan and polymerizing two such residues to form the disulfide. In practice, molecular sulfur is added to the mixture, which completes the second reaction, breaking up the lead alkylsulfide to form lead sulfide and the dialkyl disulfide which remains in the gasoline. Thus, the nature of the sulfur compounds has been changed, mercaptans eliminated or greatly reduced, but disulfides are increased in amount equivalent to the mercaptans originally present. This sweetening, by whatever process accomplished, improves the odor of the gasoline, but does not eliminate sulfur, may even increase it, and does not thus obtain the advantage of slightly improved clear octane number and greatly enhanced TEL response, both of primary importance from a technical and an economic viewpoint.

The lead sulfide process[5] is partially a variant of the doctor treating process. Lead sulfide and caustic solution are added, along with, generally, molecular sulfur; the PbS acts as a catalyst for the oxidation of mercaptans to disulfides, forming water and sodium sulfide as byproducts.

Equation of the reaction, as generally accepted, is:

$$2RSH + 2NaOH + \tfrac{1}{2}S_2 = RSSR + Na_2S + 2H_2O.$$

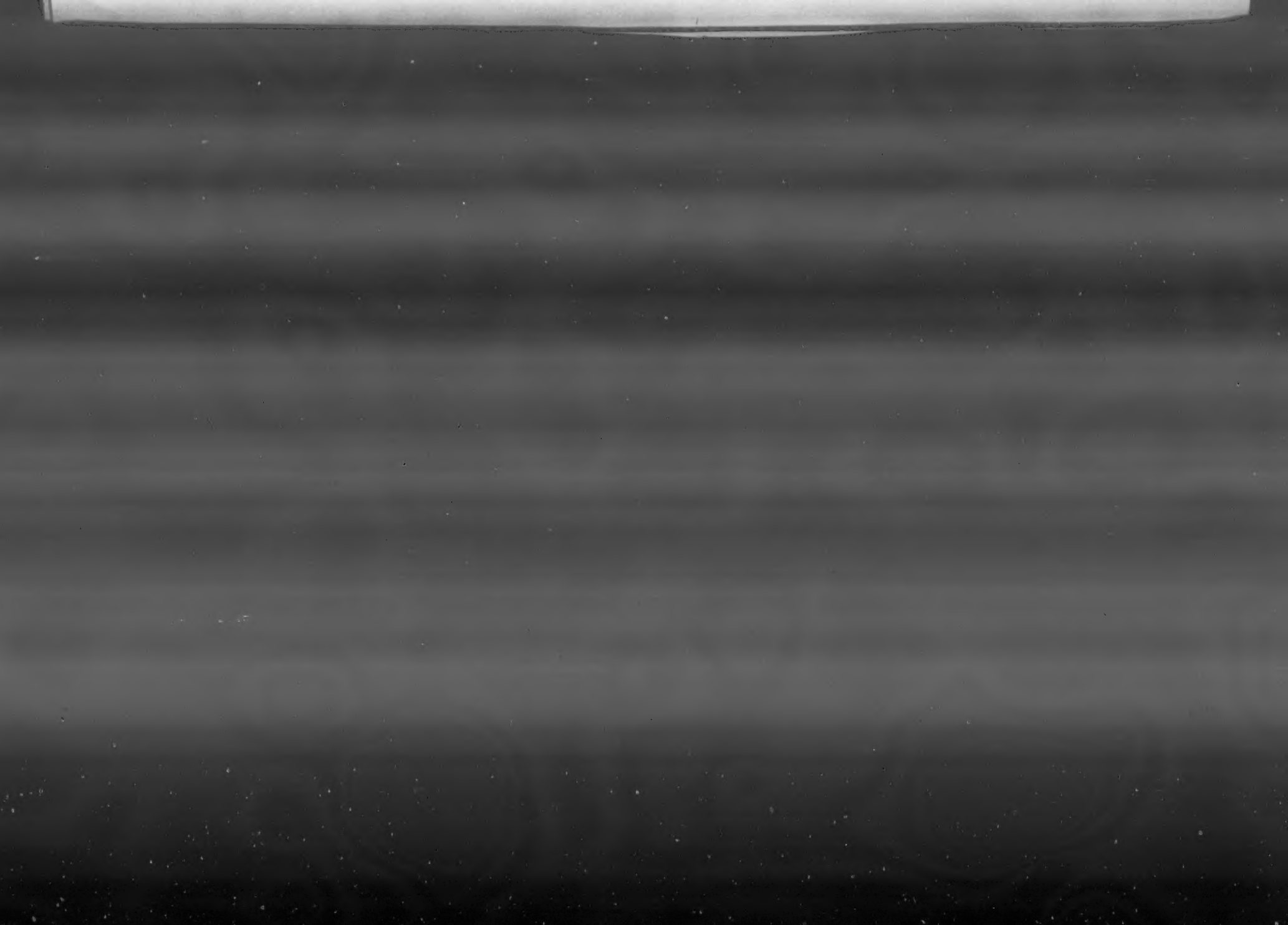
(PbS catalyst does not enter reaction products.)

This reaction actually constitutes the oxidation of mercaptans to disulfides and water. With the doctor solution saturated with air (and thus with oxygen) the lead alkyl sulfide, RS-Pb-SR, may be oxidized to PbO and disulfide, instead of PbS and disulfide by the addition of elementary sulfur. The PbO so regenerated reenters solution, to regenerate the plumbite solution by dissolving—reacting with—NaOH or Na_2S. Lead sulfide may be employed, dry, as sweetening catalyst; in this use it gradually collects gum and its reactivity deteriorates, but can be restored by treating with gum solvents such as acetone or benzol.

Sodium orthoplumbate, Na_4PbO_4, is employed to oxidize mercaptans to disulfides, four mols of mercaptan being oxidized per mol of plumbate,[6]

$$Na_4PbO_4 + 4RSH + \tfrac{1}{2}S_2 = 2RSSR + PbS + 4NaOH$$

Two mols of mercaptan are oxidized to disulfide by reduction of the PbO_4 tetravalent ion to bivalent PbO_2 ion; two more mols of mercaptan are oxidized by reduction of the PbO ion to PbS with the added sulfur, the oxygen going into the caustic soda formation. In another instance of PbS as catalyst,[29] a coating of PbS is laid on a "lead compound" solid carrier, which latter may be converted to the sulfide after deposition of the original coating, it is stated; the "lead compound" is not designated or identified. Only sulfur and caustic are added in the solution used as sweetener, together with a small amount of air to "lengthen the life of the reagent." Presumably this air is used to oxidize



the PbS to PbO, possibly forming a sort of doctor solution; or, more likely, sodium sulfide is oxidized again to caustic, or both reactions may probably occur.

The hypochlorite process employs sodium or calcium hypochlorite as oxidizing agent for mercaptans:

$$NaOCl + RSH = RSSR + NaCl + H_2O, \text{ or}$$

$$Ca(OCl)_2 + 2RSH = 2RSSR + CaCl_2 + 2H_2O$$

The hypochlorite reagent may not be regenerated, conversion of the chlorides to hypochlorite not being a simple or easily accomplished reaction in practice. Hypochlorite treatment became more or less popular before octane rating assumed its present importance. This method decreases the octane number and TEL response slightly, generally gives poorer inhibitor response and may increase the gum content.

The same reaction, oxidation of mercaptans to disulfides, is effected by treatment of the sour gasoline with copper chloride by either the solid or liquid processes.[4,12] The Schulze or Perco process forms no polysulfides with their complications of gum formation, color instability and low TEL response,[4] since no free sulfur is present as is used in doctor sweetening. The equation is

$$2CuCl_2 + 2RSH = 2CuCl + RSSR + 2HCl$$

This process shows no change in octane number, TEL response, total sulfur or gum content; inhibitor response is good if all copper is removed from the gasoline, but becomes poorer if copper is left behind.[28] Traces of copper left in the treated gasoline are removed by washing with sodium sulfide, Na_2S to improve or to prevent deterioration of the inhibitor response. This reagent is also used in slurry form, with the same principles of operation as used with liquid or solid methods. Molecular oxygen is dissolved in the sour gasoline to equal 1 to 1½ times the theoretical amount needed in the reaction, before contacting the chloride slurry; undissolved oxygen in the system is undesirable because it increases reagent carry-over from the reaction vessel and thus the copper remaining in the treated gasoline, also reagent loss is thus increased. Corrosion of equipment is a potential problem in these processes, but is eliminated or minimized in a practical manner by the use of high alloys, resinous and plastic lines, wood and composition tanks, etc. Regeneration of the spent copper solution is with air or oxygen:

$$2CuCl + 2HCl + \tfrac{1}{2}O_2 = 2CuCl_2 + H_2O$$

In the caustic scrubbing, Solutizer and Unisol processes the sulfur content of the gasoline or kerosene is reduced by solution of the mercaptans in the reagent, from which they are removed by heating, etc., during regeneration. By caustic washing the mercaptans are dissolved in part by the solution and removed from the gasoline, to be eliminated from the spent treating solution by steaming. It has been shown[28] that plain caustic solutions cannot remove the higher molecular weight mercaptans as completely as the same solutions which have picked up natural mercaptan solubility promoters such as alkylphenols and aliphatic acids from previous treatments. That is, used and regenerated caustic solutions in which these solubility promoters have collected show better results than fresh solutions not containing these materials, and for these reasons the other two main processes have been developed to improve the sulfur removal properties beyond that of caustic. While 30 per cent caustic soda solution reduces mercaptan sulfur by 82 per cent in straightrun gasoline, when 20 per cent of organic acids are present in the solution, nearly 95 per cent mercaptan sulfur is removed by the same solution, from cracked gasoline, using 10 lb. of stripping steam in each case. Doubling the amount of stripping steam increases the sulfur removal by only a few per cent. Concentration of the natural "organic acid" solubility improvers in the regenerated reagent increases the extraction coefficient, but the caustic concentration may be so reduced at the same time that the actual extraction efficiency may fall with such acid concentrations of, for example, 50 per cent of the total regenerated solution. The alkylphenols removed from the raw gasoline by caustic may be returned to the gasoline as gum inhibitors after sulfur removal, to the decided advantage of the product. The more recent experiences in sulfur removal show that the mercaptan sulfur content decreed by the "doctor sweet" specification—0.0004 per cent by weight—is far too stringent, and that gasolines containing up to 0.005 per cent mercaptan sulfur are quite satisfactory and have been marketed for several years.

Shell Solutizer Process

The Shell Solutizer process employs a 6-normal potassium hydroxide plus 3-normal potassium isobutyrate solution.[14,17,28] This solution is made up commercially by first making a 9-normal KOH, and then neutralizing one-third of the KOH present with isobutyric acid. This organic acid acts as a solubility promoter to increase the sulfur removal by dissolving these compounds and removing them from the gasoline, kerosene, etc. Temperature and pressure are essentially atmospheric, the solution is regenerated by steam stripping and is claimed to last for three years or longer. Actual removal of the sulfur compounds improves the clear octane number of the gasoline and also its TEL response. In one case reported mercaptan sulfur was reduced from 0.09 per cent to 0.0004 per cent—the doctor-treatment level—employing an 0.35:1 reagent/gasoline-treating ratio at 85° F. After treating gasoline containing 0.035 per cent mercaptan sulfur, regeneration required 26 lb. of steam per barrel of gasoline treated.

TEL savings, in making up the gasolines to 70 A.S.T.M. octane number standard was calculated at from $12.60 to $52.50 per 1,000 bbl., depending on the sulfur content and the degree of sulfur removal attained (1940). On the gasoline in which mercaptan sulfur was reduced to 0.0004 per cent, the amount of TEL required to raise it to 75 octane number was reduced from 0.65 cc. to 0.38 cc. per gallon; to reach 80 octane number this reduced the TEL required from 2.20 cc. to 1.3 cc. per gallon, equivalent to 37.8 cc. per barrel or at 0.25 cents per cubic centimeter for TEL a cost reduction of $94.50 per 1,000 bbl. treated. Incidentally, potassium alkylphenolates are used along with the i-butyrate to maintain the "organic acid" gum inhibitor concentration in the finished gasoline.[28]

Unisol Process

The Unisol (caustic-methanol) process[28] was developed for the same purpose as was the Solutizer method, that of increasing the mercaptan sulfur solubility in the reagent and therefore removing it completely from the gasoline, rather than merely to change its chemical composition and its odor. Disulfides and mercaptans have about equally bad effect on TEL response and clear octane number, as mentioned above. Methanol—wood or methyl alcohol—is added near the middle section of a packed tower into which the sour gasoline is admitted at the bottom, caustic solution near the tower top. The methanol increases the solubility of mercaptans in the caustic-methanol mixture and the sulfur products are thus removed in the mixed reagent which constitutes 3 per cent or less of the gasoline volume treated, and in which the caustic solution is about 2½ times the volume of methanol. Mercaptans and alcohol are removed from the caustic solution by steaming, and the alcohol is then recovered by distillation and reused, the sulfur material is discarded, burned or disposed of for any purpose desired.

Many technologists now consider, and present large amounts of data to prove that not only is the "doctor sweet" specification too severe but that it is too expensive, in terms of improvement realized on the gasoline. Large over-all savings are found[28] when utilizing a total mercaptan

maximum of 0.001 to 0.004 per cent instead of the 0.0004 per cent required to give a doctor-sweet gasoline. This higher percentage is easily attainable by many of these processes discussed here and used widely throughout the industry, at costs much lower than that of doctor treating, say qualified technologists, with the excellent advantage of improvement of octane number and TEL response.

Desulfurization of Gases

Along this line it is of interest to mention briefly three well-known and widely used methods for sulfur removal from gases and hydrocarbon vapors. These include the Sodium Phenolate (Koppers) process,[8] by which the difference in acidity of phenol and of H_2S at different temperatures is utilized to remove the sulfur from the gases, and then to regenerate the solution separately and reuse it for the same purpose. Sodium phenolate forms sodium mercaptide with H_2S at lower treating temperatures — 100°-125° F. and thereabouts—thus absorbing the sulfide into the solution. At the temperature of boiling water or higher, the sodium phenolate reaction is the stronger and predominates, freeing the H_2S and regenerating the reagent. Thus by contacting the sour gas at low temperatures with Na phenolate solution and absorbing the H_2S, removing the solution and heating it to boiling the sulfide is removed quantitatively.

The potassium triphosphate process (Shell)[9] replaces one of the K atoms with hydrogen to form KSH,

$$K_3PO_4 + H_2S = K_2HPO_4 + KSH$$

Heating this sulfur-fouled solution and concentrating it reverses this reaction and frees the H_2S, regenerates the reagent.

In the Girbotol amine process[11] solutions of organic amines such as mono-, di- and triethanolamines are brought into contact with sour gases, absorb the sulfur such as H_2S, the solution is separated and heated by which action the acid sulfide of the amine is decomposed, regenerating the reagent and freeing the sulfide. Carbon dioxide may also be absorbed and concentrated or eliminated as desired, by this process. By the inclusion of a second step with diethylene glycol, gases may be dehydrated at the same time, a step which is used to eliminate the gas hydrate formation with resultant clogging and stopping of gas lines. Treating costs (1939) are claimed to be less than 0.5 cent per 1,000 cu. ft. with sulfur up to 300 grains per 100 cu. ft.; 2 cents or less for gases containing up to 4,000-5,000 grains per 100 cu. ft.

Sulfuric acid desulfurization is not strictly either a catalytic or a solvent process. H_2SO_4 oxidizes mercaptans to disulfides which are then dissolved in the acid and thus removed. The acid reacts chemically with other sulfur products, and also dissolves some of them; reacts with diolefins and gum-forming materials present, also with monoolefins to form alkylsulfates; many other complex and little understood reactions occur when concentrated sulfuric acid is brought into contact with gasoline containing these materials. This acid was used widely and effectively to purify and refine both straightrun and cracked, sour and sweet gasolines before octane number came to be so all-important. The acid decreases the octane number of cracked distillates seriously and is now used only when absolutely necessary to desulfurize high-sulfur gasolines which cannot be refined satisfactorily by less drastic methods. Two of the most important advances in acid treating are the Halloran low-temperature process, employing refrigeration to reduce the reactivity of the acid as well as the solubility of various materials therein[9]; and the Stratcold process, a combination of low-temperature treating with rapid mixing and separation of acid and distillate via contactors and centrifuges. As a practical matter these processes are limited in economic application mainly to California, West Texas and other high sulfur crudes and their products to which the methods have been applied, however, with excellent results, considering the nature of the raw materials.

Catalytic Desulfurization

Three main catalytic processes are in use for desulfurizing especially light distillates, cracked or straightrun. These came as a result of the before-mentioned discovery of the bad effect of sulfur itself in many forms, especially H_2S, mercaptans and tetrasulfides, on octane ratings and TEL response, as result of the desirability of removing the sulfur entirely from the raw product.

The Gray catalytic process[22] uses an absorbent catalyst such as fuller's earth, clays which may be activated by special treatment before use. Sulfur is removed to the extent of 60-85 per cent of the total present; mercaptan sulfur is totally eliminated, nonmercaptan sulfur reduced to 0.006 per cent, total. It is claimed that product loss is very low, ½ per cent being ample allowance in calculations to cover this item. Clear octane number is raised 1.9 to 4.7 numbers (A.S.T.M.), with an increase in the octane number improvement obtained from 3 cc. of TEL or 3.9 to 6.2 numbers, or a corresponding reduction in the TEL required to attain a given rating.

Desulfurization by bauxite catalyst has shown remarkably good results.[19,16] Straightrun products lose up to 85 per cent sulfur; cracked distillates up to 50 per cent. Four to six tons of catalyst are required per 1,000 bbl. of daily charge capacity of the unit. The 1940 catalyst price was quoted at $35 per ton; product loss is less than 1 per cent; TEL savings is up to 18 cents per barrel, with direct operating charges of 5-6 cents per barrel. Operation is at low pressures of 15-50 lb. per bbl., at 700°-750° F. and, for example, two volumes of charge per volume of catalyst. In one typical case total sulfur was reduced from 0.425 per cent to 0.11 per cent, clear octane number raised from 45 to 48 A.S.T.M.; TEL response was improved from 5.3 units for 1 cc. in the charge to 15.3 in the desulfurized product.

Houdry Process

The Houdry catalytic treating process[27] employs a special catalyst of the "hydrated silicate of alumina" type, the sulfur-bearing charge being introduced to the solid catalyst in treater cases at about 650° F. and pressure of 200 lb. or thereabouts. Sulfur is reduced to a very low value; sour distillates are sweetened, gum content is lowered to satisfactory values for motor fuel and octane number is not changed or slightly improved. Less than 2 per cent polymer is formed boiling above gasoline range. The catalyst cases are alternated on reaction-regeneration cycles of 3 hours, one case being in reaction while the other is being regenerated by burning the carbon, sulfur, tar, etc., from the catalyst with controlled amounts of air while heat-removal means, a cooling liquid, is circulated through the catalyst bed being regenerated to keep the temperature at 1,000° F. or lower.

In addition to these better known and widely used processes, a large number of technologists have studied sulfur removal and sweetening exhaustively. The Lachman process[5] used zinc chloride ($ZnCl_2$) at temperatures ranging from 265°-410° F. in a vapor phase process. It is claimed to polymerize diolefins to gummy materials, removing 30-40 per cent of the sulfur and sweetening the gasoline. Russian technologists have studied the use of zinc chloride, zinc hydroxide, etc., and in one case find that the hydroxide reduces S content from 1.19 per cent to 0.13-0.16 per cent; sulfur in cracked naphtha from 0.40 per cent to 0.16 per cent.[26] Zinc chloride they found to hydrolyze to the hydroxide, apparently, which is the active reagent.[26]

Other reagents are a combination of sulfonated oil and metal halide catalyst,[20] aliphatic sulfonic acids,[25] furfural extraction plus sulfuric acid treatment,[23] treatment with clays at high temperatures,[21] and a combination of caustic scrubbing followed by H_2SO_4 treating[28] on a high-sulfur Iraq oil (2.40 per cent S), have shown good

results for different investigators and have been used in different instances.

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Catalytic Reforming of Straightrun Gasoline

(Continued from Page 93)

of the Pennsylvania straightrun gasoline to produce an aviation-base fuel. The results of these experiments are given in Experiments 11 and 12, Table 3. It may be noted that two-stage, two-catalyst aromatization produced 86.2 per cent of 80-octane gasoline. The aromatic content of the finished product was 57 per cent. As before, pure dehydrogenation-type reactions resulted in an almost quantitative yield of product in the first stage. Hydrogen content of the reaction gases in this step was 97.9 per cent. In the second stage, 83 per cent of the reformed product was aromatic and olefin hydrocarbons while only 17 per cent remained as paraffin hydrocarbons.

In Fig. 3 the yield-octane relationship for single-stage reforming with the chromia-alumina catalyst is given. The point plotted for the two-stage reforming of the same stock clearly demonstrates the superiority of the two-stage aromatization as a method for producing high yields of high-octane fuel. Thus, for an 86.2 per cent yield, single-stage reforming would yield a product of 71.5 octane number whereas 80 was obtained by two-stage aromatization.

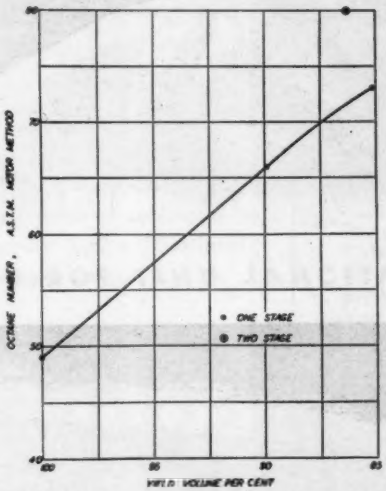

Fig. 3—Yield-octane relationship for reforming 70°-150° C. fraction

D. Single-Stage Procedure

A series of experiments was also made in which the 70°-150° C. fraction was aromatized in a single stage by means of nickel-chromia-alumina catalyst at short contact times and high temperatures. The carbon deposited on the catalyst varied directly with the octane number of the reformed product and was higher than was obtained at lower temperatures. The results of these experiments are given in Table 4. The highest octane value received was 90 when the liquid recovery by volume was 67 per cent. The recovery by weight was 75 per cent. The content of aromatics was 76 per cent.

Acknowledgment

Acknowledgment is due the Universal Oil Products Co. for the octane-number determinations and for the grant of a fellowship to one of us (C.H.R.).

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TABLE 4
Production of Aviation-Base Gasoline

Experiment	13	14	15	16
Fraction aromatized	2-3	2-3	2-3	2-3
Catalyst	D	D	D	D
Temperature	500	550	550	550
Liquid recovery, volume per cent	90.0	76.5	80.5	67.0
Carbon, weight per cent	2.7	4.5	3.0	9.3
Octane number, A.S.T.M. motor method	69	80	70	90
Gas analysis, mol. per cent:				
Hydrogen	90.8	87.3	88.2	...
Olefins	1.3	1.9	2.8	...
Paraffins	7.9	10.8	9.0	...

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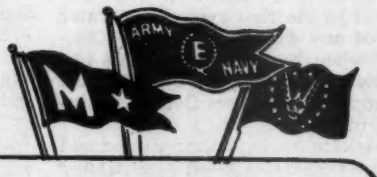

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BRIEF SPECIFICATIONS

BEAM COUNTERWEIGHTED TYPES					
Type	TU24G-JD2TP	TU44G-HD4TP	TU104G-HD10TP	TU164G-HD16TP	TU234GS-JD23TP
A. P. I. Walking Beam Rating, pounds	3200	4100	6725	8900	11,000
*Former Walking Beam Rating, pounds	3820	5000	8050	10,900	13,280
A. P. I. Peak Torque Capacity at 20 spm, in-lbs.	6360	11,050	24,300	40,200	57,200
Overall Gear Ratio	26	29.5	29.2	29.2	29.8
Maximum Polished Rod Stroke, inches	16	20	28	34	42

CRANK COUNTERWEIGHTED TYPES										
Type	TU304-HD30TB	TU304-H46TB	TU304-HD46TB	TU464-H46TB	TU464-HD46TB	TU804-H60T	TU804-HD60T	TU804-H80T	TU804-HD80T	TU1604-HD160T
A. P. I. Walking Beam Rating, pounds	12,750	12,750	12,750	15,000	15,000	22,000	22,000	22,000	22,000	32,400
*Former Walking Beam Rating, pounds	15,300	15,300	15,300	18,000	18,000	26,500	26,500	26,500	26,500	39,400
A. P. I. Peak Torque Capacity at 20 spm, in-lbs.	76,500	124,000	113,000	124,000	113,000	170,000	139,000	238,000	200,000	432,500
Overall Gear Ratio	29.6	10.2	30.8	10.2	30.8	9.7	26.8	9.4	28.3	30.3
Maximum Polished Rod Stroke, inches	48	48	48	54	54	64	64	72	72	120

*Former A. P. I. Beam Rating (Aug. 1935)

Practices Devised for Chanute Water Flooding

by Paul Reed

At the start of Mid-Continent water flooding it was predicted by Donald P. Oak that the most satisfactory results would be obtained when practices would be developed particularly for conditions in this area. Since water flooding is a business with a resemblance to manufacturing, it was obvious that such practices would be the outcome of consistent programs carried forward steadily with careful planning and close study of all factors.

Today some of the steps taken in developing an efficient Mid-Continent water-flooding technique can be traced by observing advances made in the operation of the Lynde, Walter & Darby properties east of Chanute which probably represent the most prominent project of this type of secondary recovery in Kansas.

THE growth of improved practices on the Lynde, Walter & Darby water-flooding properties has a unique history because it is the outcome of experience and study of Donald P. Oak, petroleum engineer, who was engaged in the first systematic water flood of any extent in the Mid-Continent when he and Burt Collins undertook the flooding of a Carter Oil Co. property in Rogers County, Oklahoma, in 1931.

In looking back to the initial flood of this organization on the Kaney lease at the south end of the group of properties 2 miles east of Chanute, the general procedure appears to have been along conventional lines in many respects. For later operations, the company adopted a policy for more rapid exploitation and for obtaining longer service from equipment. To accomplish this, all equipment was planned with the object of having it as portable as possible. Tanks, as well as pumping jacks, can be quickly moved to other properties as the operations progress.

The organization has acquired more than 2,000 producing acres in the vicinity of Chanute. Substantial equipment is bought, capable of serving the project for 25 years as development proceeds from one lease to another. Progress made in improving practices can be observed as the organization has gone from one property to another. The following are the names of the properties in the order in which they have been developed with the daily production at the time they were originally acquired:

Property	Prod. before flooding (bbl.)	Date of beginning of flooding
Kaney	6	Dec. 1937
Ingraham	13	Apr. 1938
American	14	July 1941
Charles Beach	24	Nov. 1942

These properties made ½ to ¾ bbl. per well with a possible average of ⅝ bbl.

Coring Program

As time has gone on, it has been found wise to procure the fullest possible information regarding reservoir conditions in order to avoid unnecessary expense in the drilling of unprofitable wells near the edges of the sand bodies. The progressive increase in coring is illustrated by the fact that on the first lease, the Kaney property, only one core was taken, on the Ingraham three cores were taken, and on the American and the Beach, every well was cored.

In coring, it was found there was little vertical permeability, Subsequent experience showed that it is not profitable to drill to the edge of marine bars where there is an increase in the amount of shale. It appears that the sand bars may have been laid down at different times which would account for the differences in their characteristics. On one part of the Beach lease, there is a crosstrend of sand which appears to have been laid in a river bed traversing an old marine bar. Permeability of the river bed sand has been from 1,000 to 2,000 md. This sand is high-

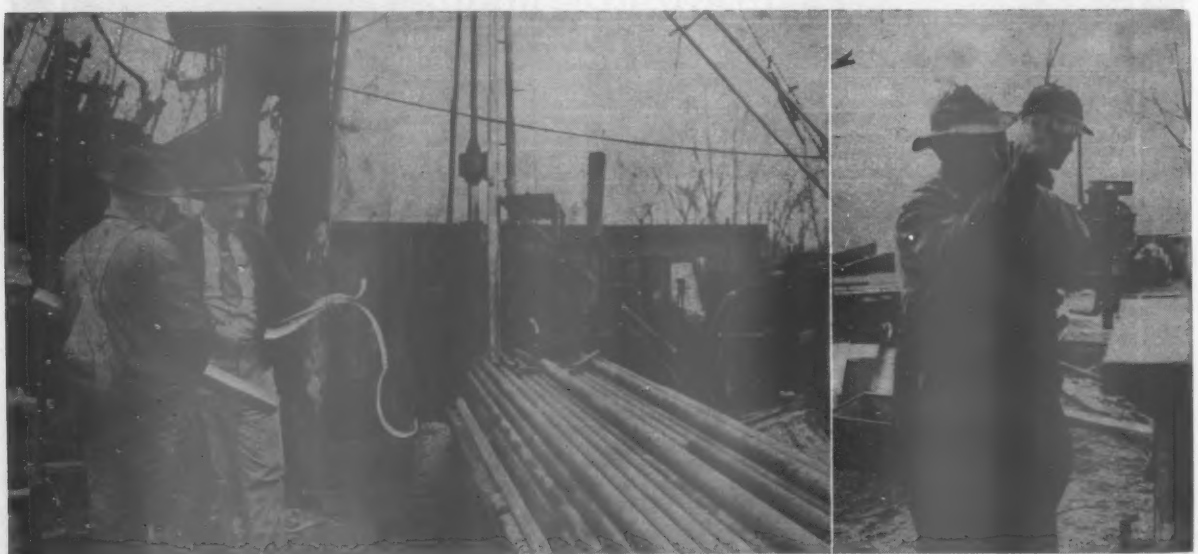


Fig. 1 (left)—While a well is cored, sampling is handled directly by the superintendent, J. O. Couch, to insure an appropriate selection of parts of the core for saturation and flood-potential tests in the laboratory. Fig. 2 (right)—Sections of the core for laboratory analysis are promptly sealed in an air-tight can by a home-canning device while the core is being sampled

ly saturated and probably has the highest permeability of any sand ever water flooded. Permeabilities of the main body of the sand on the Beach are between 400 to 500 md.

As a result of the policy of coring every well in the development of the American lease, which was started in July 1941, data obtained in analyses made it possible to avoid the drilling

Fig. 3—Pumping wells are equipped with electric-driven pumping units mounted on concrete blocks cast by employes on the property. Unit and block can be loaded together on a truck when it is later removed to another well. The unit has been elevated at this location to place it above the flood water level

of a number of useless wells, sufficient to save enough money to pay for the entire cost of shooting.

The success of production operations may be improved considerably by data obtained from coring indicating appropriate sizes of shots and the proper depths for selective shooting. Information from coring indicates the proper input rate to employ and provide means for estimating oil in place and the percentage of recoverable oil. Direct results from core analysis have been satisfactory and correction factors have not proved their worth.

Indications are that predictions based on the analyses of cores of all wells of a property like the American will not vary 10 per cent from results actually obtained in producing operations. If only one core had been taken, it would be only a matter of luck if such an accurate prediction could have been made. The accuracy of predictions achieved as a result of a 100 per cent coring program is attested by comparison of actual production on a certain day with estimates made a year ahead of time by core laboratories working independently. An eastern laboratory estimated that the American lease would produce 295 bbl. on that day; a Mid-Continent laboratory predicted 310 bbl.; oil produced was 305 bbl.

A number of the features of drilling and completing are similar for both input and producing wells even though input wells have tubing cemented at the top of the sand, and no casing, while producing wells are equipped with both tubing and casing.

The organization plans development so that one or two drilling machines are active on its properties through most of the year. Drilling and the cementing of tubing is contracted. Coring and the pulling of pipe, after the completion of input wells, is done by crews of Lynde, Walter & Darby with their own equipment.

All wells have 25 ft. of 10-in. surface casing. Input wells have a 5 to 10-ft. pocket in shale and producing wells have a pocket no deeper than 15 ft. because of a lower gas sand.

The sand body, in places more than

Fig. 4—Welded frames for supporting servicing equipment on boggy ground. Both frames and pipe on which they rest can be readily moved to another location

40 ft. thick, is found at depths of 700 to 780 ft.

In drilling input wells, 525 ft. of an 8-in. water string is set before drilling to the top of the sand with an 8-in. hole. The 3-in. hole left after the 2-in. rotary core is taken is reamed to 6¼-in. Following cleaning out after shooting, a rag packer, consisting of a 2-in. by 4⅞-in. swedge nipple wrapped with burlap, is run down to the top of the shot hole and pulled up 18 in. to 3 ft. to fit. The packer is placed as close to the shot hole as possible. No anchor is used. After dumping in 40 to 50 lb., or half a bucket, of Joplin chat, the packer is pulled up 1 to 2 ft. more until it freezes. The 2-in. tubing is clamped and cemented with 5 to 12 sacks of cement and 500 lb. of sand. Three days after cementing, the casing is pulled.

This method is a departure from the conventional one of setting a standard packer on an anchor.

The procedure for completing a producing well is much the same. At the lower end of the 5⅞-in. casing there is a 6¼-in. swedge nipple wrapped with burlap. Around the tubing of input wells and around the casing of producing wells, the hole is filled with spud clay. About 4 lb. of lime is mixed per 100 lb. of spud clay, raising pH to 7.8. No corrosion has been observed in 5 years where this practice has been followed.

In recovering tubing when wells are abandoned, experience with the pulling of several strings shows that only 60 to 70 ft. of pipe is lost.

When a producing well of the organization is changed from pumping to flowing, tubing is pulled and the well flows through the casing.

The policy followed in spacing patterns as development progressed can be observed in the following data:

	Feet
Kaney	330-330
South Ingraham	330-330
North Ingraham	330-385
American	330-440
Charles Beach	385-385

The usual five-spot pattern has been used throughout.

Water is pumped from the Neosho River to a treating plant on the Kaney lease, where it is first treated in an earthen pit 200 ft. by 125 ft. which was built last November. Water comes to a concrete box with an overflow to allow excess water to escape before it

Fig. 5—Welded support to raise pumping unit above flood water level rests on a removable concrete block

enters the pit. From the concrete box the water flows through an earthen trough containing brick baffles. The earthen pit itself has two earthen baffles which insure that the water is well aerated before going to the treating plant where alum-lime and chloride of lime are added to it before the water goes to the filters.

No evidence is reported to indicate that sand at input wells is clogged as a result of supersaturation of injection water or corrosion of lead lines. The oldest well on the project is still taking water satisfactorily. Every morning pH and saturation tests of

Fig. 6—Meters for dual completion well, buried to prevent freezing

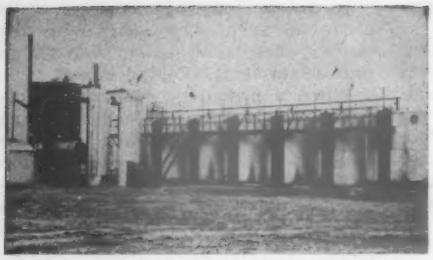


Fig. 7 (upper left)—Treating and storage equipment on the Beach lease

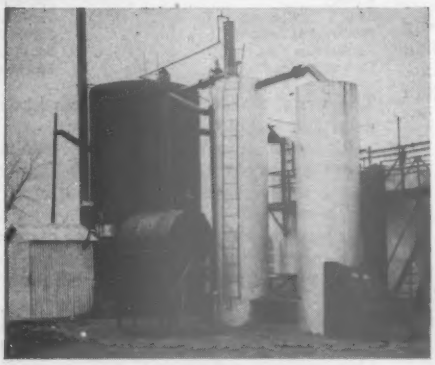
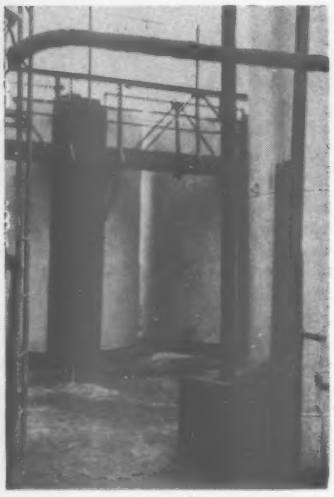


Fig. 8 (middle left)—Treating equipment with automatic crude-oil burner housed at left on side of insulated heating tank. Horizontal tank holds fuel oil. Vertical tanks knock out large part of water before fluid reaches heating tank

Fig. 9 (lower left)—Base of tanks showing welded frames supporting tanks which rest on concrete blocks, all of which can be easily moved to another location when conditions require

Fig. 10 (below)—Crank-and-winch line device for raising and lowering gun-barrel-type siphon connected with second vertical knockout tank



the water are made. Twice a month water is analyzed at a nearby commercial laboratory.

Instead of having a meter at each well placed in a freeze box, all meters are buried to prevent freezing in the winter time. Meters are grouped with three together so that a man can walk down the line and read all of the meters on a property with a minimum of effort.

One of the troublesome problems in producing water-flood oil in the area is that of eliminating water in suspension; this is not regarded as a true emulsion. Steady changes have been made in the design of equipment for eliminating water from the oil. The most satisfactory installation is one which is used on the Beach lease where an oil burner is placed in a chamber in the side of the treating tank.

To date very few installations of automatic burners using crude oil for fuel are reported in the producing area in which the organization is operating. Where automatic burners are used, the fuel is usually gas. The same type of automatic burner is used on the American as well as the Beach. Because of the larger amount of oil treated on the American, the efficiency of such a burner is shown by fuel consumption and treated oil figures for 3 months, this year, in the following table:

FUEL FOR TREATING OIL IN 3 MONTHS OF 1943

Month—	Bbl. of crude consumed by automatic burner	Bbl. of crude treated
March	44	9,300
April	31	8,975
May	34	8,735

Water knockout and storage practices of the organization have evolved from experience with successive installations. Steps in the evolution can be traced by equipment adopted at intervals between 1938 and 1942 on the Kaney, Ingraham, American and Beach leases. The Beach installation has proved to be the most economical and efficient. No free water is produced on the Beach lease; about 5 to 10 per cent water is in suspension in the oil.

For the first stages of water knockout, two vertical tanks were found to be more effective than a long tilted tank such as was installed on the Ingraham. At the Beach installation, the oil containing water is delivered into the lower part of the first vertical tank through a slanted riser, protected by a box containing insulating material. Oil rises through water and is siphoned to the top of the second tank. Fluid, mostly water, is siphoned by an insulated line near the ground to the bottom of the second vertical tank, from the opposite side of which water flows to a drain, through a gun-barrel-type siphon, the height of which can be adjusted by an ingenious crank-and-winch device. Vapor is piped from a small separator on the second vertical tank via a separator on the heating and final settling tank to the stock tanks.

The mixture of water and oil entering the heating tank is dispersed by a pipe spreader 3 ft. from the bottom. Heat is applied by an automatic oil burner set in a chamber protruding into the tank. Water level is maintained several feet above the burner chamber. The oil burner is controlled automatically for minimum and maximum temperature. There is a third control which shuts down the burner if heat in the stack fails to rise 30 seconds after operation of the oil burner is started or if stack temperature rises above a certain degree. Oil for the burner is preheated by passing through a line which encircles the heating tank underneath the insulation completely covering the whole tank. The horizontal fuel tank is supported on a rack.

By knocking out most of the water in the two vertical tanks, less fuel is required for removing the small amount which remains in suspension when the oil reaches the heating tank.

Each stock tank is supported on a square frame made of welded pipe; such a frame rests on concrete blocks. Tanks are at a sufficient distance from the ground to avoid corrosion as well as to provide space for wood or gas fires under the tanks for heating the oil in case of stoppage of the automatic oil burner.

In accordance with the policy of having all lease equipment portable, the concrete blocks on which the tank-support frames rest are small enough to be loaded on trucks when it later becomes desirable to move them to another location. Like the foundations for pumping jacks, the blocks for tank foundations are cast on the property. In blocks for both purposes, steel loops or staples are cast in the concrete block to facilitate handling with truck-winch equipment.

All lead lines are lined with cement. Return water from wells goes to the treating plant through Transite pipe.

Unitized Water-Disposal Project Works Effectively and Economically

by Neil Williams

EFFECTIVE control of salt-water disposal in the South Burrton field, Reno County, Kansas, is being made possible by operation of a community disposal system. The system is owned by the South Burrton Pool Water Disposal Association, composed of 12 producers in the area, and is one of the largest of its kind in the state. It has reduced costs of water disposal for the individual members to a relatively low figure, and has greatly facilitated handling of the water.

Disposal is by means of a single well, which, since the system was placed in operation February 1, 1941, has taken approximately 2,730,000 bbl. of water. The system now is handling approximately 85,000 bbl. of water monthly, the production of 59 wells owned by members of the association. Capacity of the system is 8,000 bbl. daily. So far the disposal well has taken the water entirely by gravity at 28 to 30 points vacuum, and although in operation over 2 years, it as yet has not had to be cleaned out or worked upon.

Producing companies represented in the association include Ohio Oil Co., Cities Service Oil Co., Barnsdall Oil Co., H. G. Bennett, Nadel & Gussman, Bridgeport Machine Co., Derby Oil Co., McPherson Drilling Co., and Phillips Petroleum Co. Operation of the system is by Barnsdall Oil Co., in conjunction with a governing committee composed of representatives of the participating producers.

The water is injected into the Reagan sand, which in the South Burrton field is unproductive of oil, and which lies below the regular producing horizons of the field. Total depth of the disposal well is 4,600 ft. with the Reagan sand being topped around 4,570 ft. The well, which originally had been a producer in the chat at a depth of 3,383 ft., was taken over by the association from Nadel & Gussman, one of the participating companies, and deepened after the project was launched.

Former Method

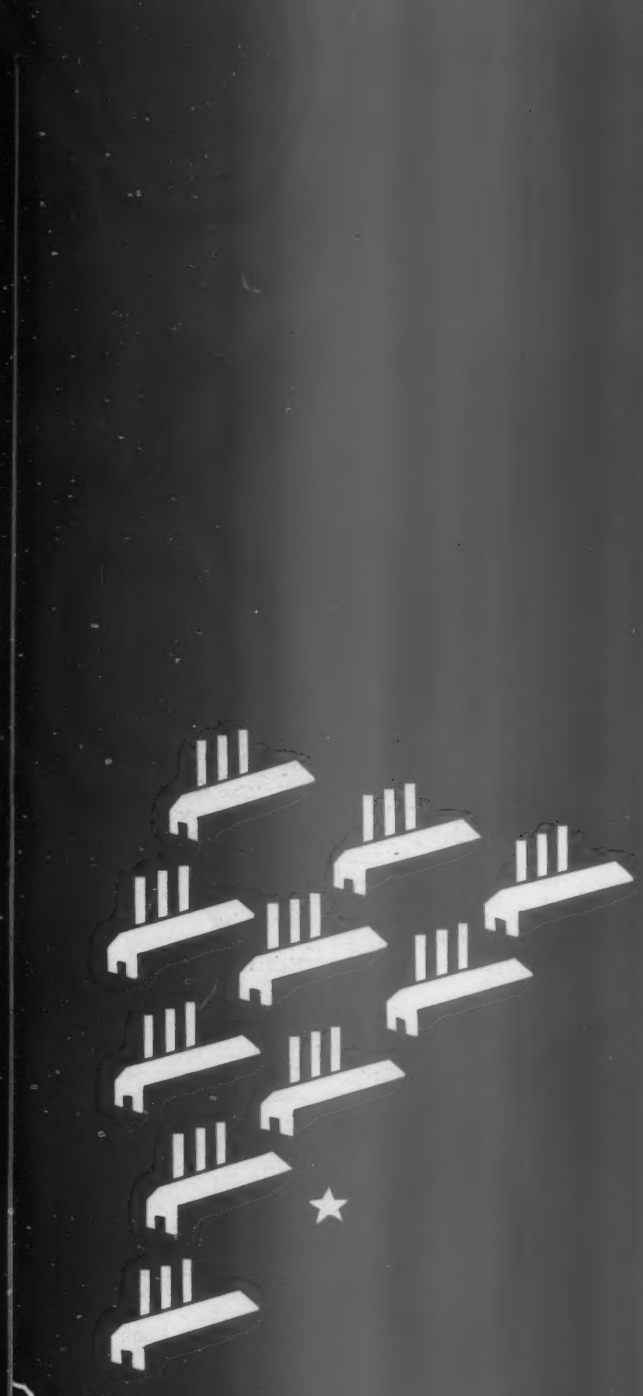
Prior to operation of the community system, the water was disposed of by the various producers through individual wells to shallow formations. Use of the shallow formations created a number of problems and complications due to the danger of the water getting into possible oil zones or into producing wells through developing leaks in old casing. With the rapidly increasing water production in the field it became necessary for the producers to work out other means of disposal.

Several factors made a unified effort to control the disposition of the water desirable. First, the Reagan sand, which appeared the most suitable formation for disposal purposes, was at a much greater depth than the producing horizons of the field and to provide disposal wells would have occasioned deepening of old wells or drilling new holes. The cost of providing separate wells for the individual operators would have been excessive and unnecessary, especially since one well in the community project is adequate for the entire water output. Advantages also were to be gained by a single large system, eliminating duplication of systems and efforts, and also by assurances of greater protection in handling of water.

Location of the community disposal well and the receiving and settling pits is at the lowest surface point of the area served, permitting a gravity flow gathering system from all leases. At no place are any pumps used, although provision is made at the settling pits for installation of pumps should it become necessary to inject the water by pressure.

When taken over by the association, the disposal well, then an old chat well that had gone off production, had 7-in. o.d. casing in the hole at 3,336 ft. with 12½-in. surface casing at 493 ft. Parker Drilling Co. was given the contract for deepening the hole to the Reagan sand. In this 6¼-in. hole was drilled with rotary tools to 4,046.53, where 5½-in., 15-lb. liner

Fig. 1 (Left)—Receiving and settling pit showing one of the two 8-in. incoming asbestos-cement lines in foreground. Injection well at extreme right. Fig. 2 (Right)—Receiving and settling pit showing pump and control pit in foreground. So far pumps have not been needed



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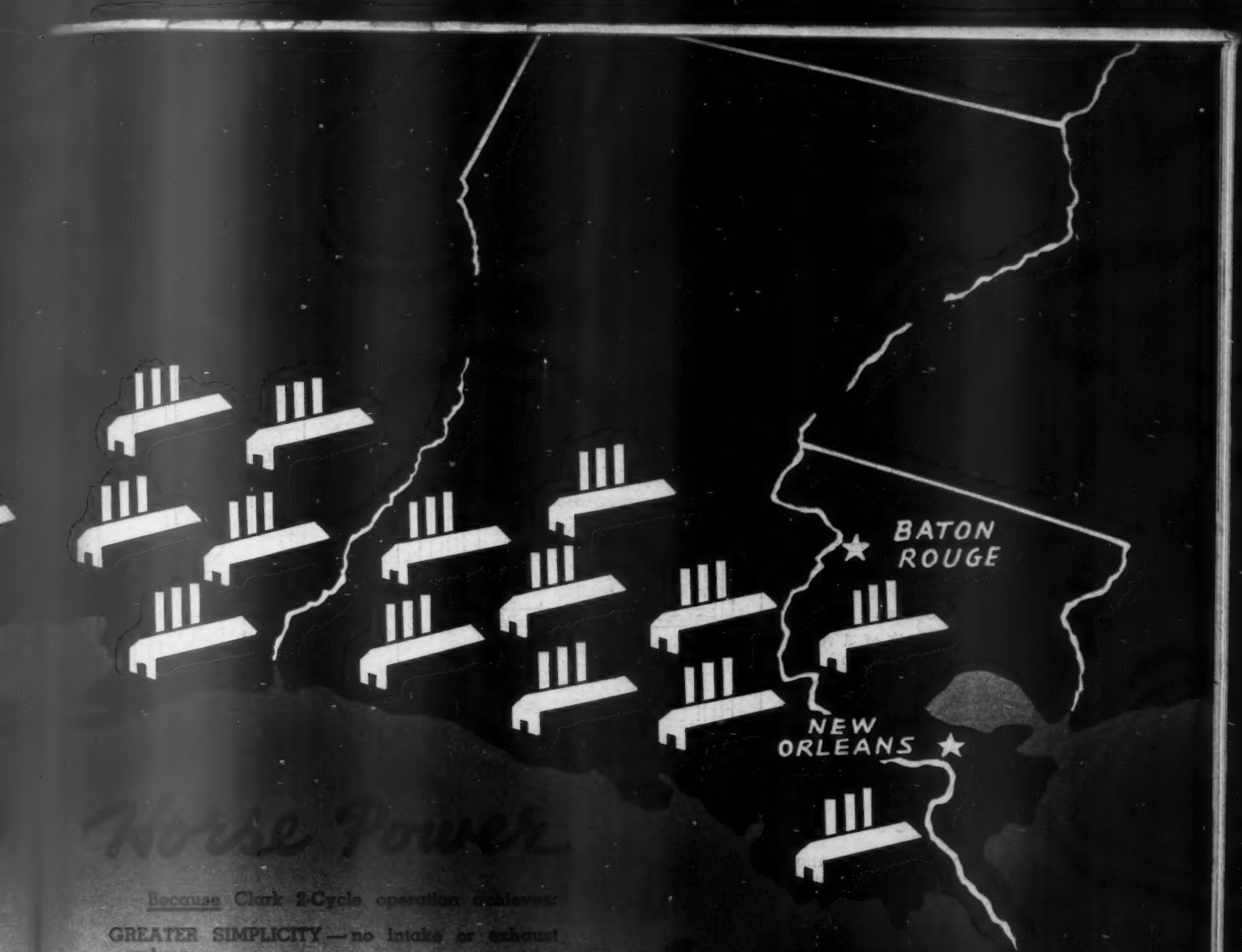

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was set and cemented with top in the 7-in. casing at 3,135.33 ft. Below the liner there is 4½-in. open hole to bottom. For completion of the well, 4-in. tubing was set with bottom-hole packer on top of the 5½-in. liner. The bottom 2,000 ft. of the string is 15.05-lb. Duroline tubing as protection against corrosion up to that point. The upper part of the string, approximately 1,100 ft., is 13.60-lb. regular seamless tubing.

Before acidizing the formation to complete, water was pumped in the hole for 6 hours, with the well taking the water at the rate of 350 bbl. per hour at 700 lb. pressure. After acidizing with 4,000 gal. of acid, it took the water at the rate of 487 bbl. per hour at 150-lb. pump pressure, and 263 bbl. per hour by gravity. The present rate of water disposal is from 118 to 120 bbl. per hour at 25 to 30 points vacuum.

Disposal System

The disposal system is of a semi-closed type. The receiving and settling pit, near the disposal well, is of concrete construction and, exclusive of an auxiliary pit for control valves and a pump if needed, is 70 ft. long by 20 ft. wide by 6 ft. deep, giving it a capacity of approximately 1,700 bbl. Baffles across the width divide the pit into four sections, a receiving or initial settling pit, two intermediate settlling pits and a final settling pit. The water flows continuously to the successive pits through 10 8-in. circular openings of Transite pipe in the bottoms of the baffles. A float-controlled gate in the bottom outlet line from the final settling pit to the well regulates the fluid level in the pits and the volume of water to the well.

No chemical or other treating of the water has been necessary. Deposition of solids and accumulations of sludge in the well after nearly 2½ years has not been sufficient to prevent the well from taking water. Because of the hydrogen sulfide content, a scum of oil is allowed to remain on the surface of the water through the pits which tends to prevent exposure of the water to the air. Any excessive accumulation of oil and sediment on the water in the pit is bailed off manually. Pits are completely covered with a gabled roof of wood with roofing paper covering to keep out rain, rabbits, sand and wind-blown debris.

Garthering lines total approximately 32,663 ft., consisting of 500 ft. of 10¾-in., cement-lined steel pipe, 2,449 ft. of 8-in. pipe, 2,878 ft. of 6-in., 4,354 ft. of 4-in., 18,613 ft. of 3-in. and 4,967 ft. of 2-in. All lines, except the 10¾-in. river crossing and including the lines from the pits to the well, are of asbestos-cement as protection

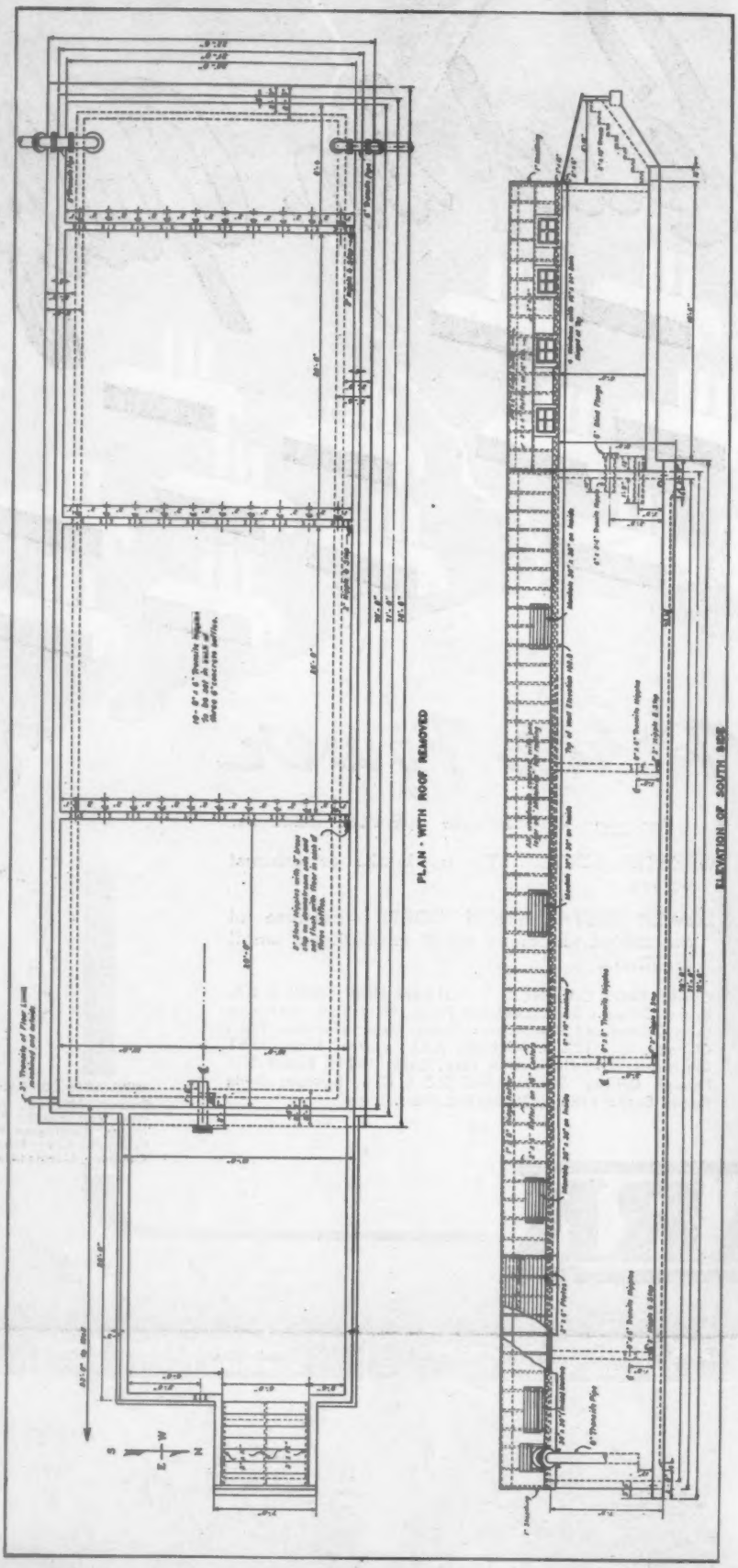

Fig. 3—Plan and elevation, salt-water disposal pit, South Burrton disposal system

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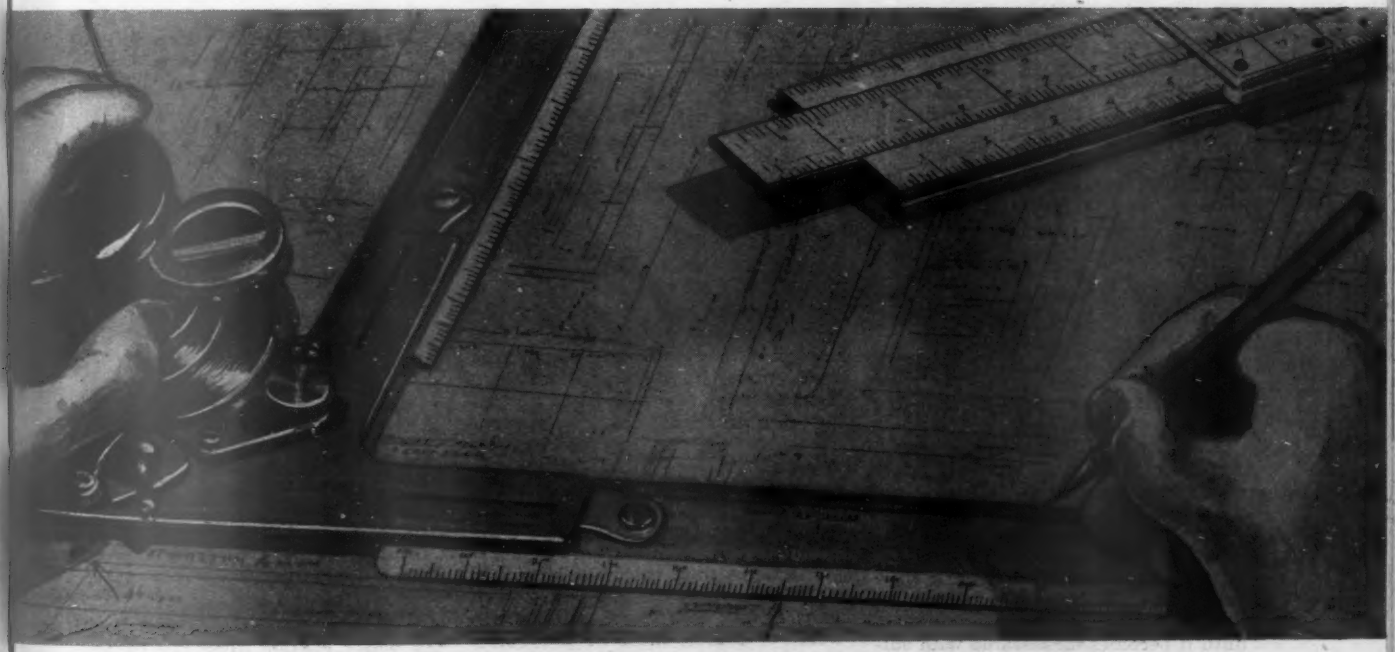

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against corrosion. At no place from the leases to the disposal well does water come in contact with any metal.

In the division of responsibility between the association and the participants, the association has supervision over the construction, operation and maintenance of the system, including all gathering lines up to lease batteries of the member companies. The members are required to impound their own water on their own leases, and to make their own connections to the association's lines. Members are responsible for delivery of their water to the gathering system under sufficient head to insure its movement to the system. So far gravity has been adequate for delivery in all cases. Also the members must deliver their water free of all solid matter and basic sediment.

The association is obligated to accept and dispose of all water from the individual members up to 200 bbl. per day per well. If the amount of water produced by a member exceeds this amount, the excess will be taken only on a ratable basis with the excess of other members up to a capacity that will not overload the system. Members must dispose of any additional water, and are responsible for any pollution or damage caused by water produced in excess of the system's maximum capacity as set by the governing committee.

ABSTRACTS

of papers presented before American Society of Mechanical Engineers, Petroleum Division, at Los Angeles, California, June 14-17, 1943

ENGINE WEAR AND ITS MEASUREMENT IN THE STUDY OF LUBRICATION.

A. G. Cattaneo, W. Gasser and W. N. Malott, Shell Development Co., Emeryville, Calif.

THERE is a difference between the wear due to the inherent design of the internal combustion engine, and the wear with which the operator of commercial engines is most familiar. The latter is largely due to foreign influences, such as dirt and dust, maladjustment of engine parts, and other operating practices, which usually overshadow the basic wear with which we are concerned in the more fundamental study of lubrication. Only stationary engines or aircraft engines when operating under ideal conditions are likely to approach the basic wear, through the absence or exclusion of ulterior factors.

As this basic wear is usually very low, it would take an impractical length of time to let it accumulate until it becomes measurable with sufficient accuracy by conventional methods, such as the micrometer. Therefore, more precise methods of measurement had to be developed, but even then careful interpretation of the results is necessary.

Bearings are commonly said to wear, yet we know today that wear cannot be caused by abrasion if we exclude such abrasion as may be caused during the start, or by foreign particles entering the oil. Therefore, the problem is one of corrosion, particularly in stationary or aircraft engines in which the number of cold starts per hour of operation is very low. Its measurement, by the weight loss of the bearing shell, is usually quite simple.

The places in the engine where strictly abrasive wear is found are mainly the valve guides, cams, and the gears, and their wear is easily measured and interpreted.

However, the most troublesome spot in regard to wear is the piston ring and cylinder liner region. Here what is called wear is composed of a number of phenomena: scuffing, scratching, corroding, and eroding. In most automotive type engines, diesel or gasoline, this wear is an important, but not necessarily a predominant problem. But in aircraft engines the problem can assume catastrophical proportions; thus, cases are known in which the rings were completely worn away in four hours of operation. Such wear, of course, must be prevented. In another case, however, that of the breaking in of new engines, rapid wear, if well controlled, is actually a desirable thing. Again it is the aircraft engine which is the most critical. As the first job of a new engine in an airplane is that of taking off the airplane at full rated power, the break-in must be completed in the factory before the engine is installed.

Effect of air-fuel ratio.—The tremendous effect upon wear of chemical and physical factors in engine operation is well illustrated by some work which we undertook to establish the degree of control in regard to the air-fuel mixture, necessary for reproducible tests. Fig. 1 shows the

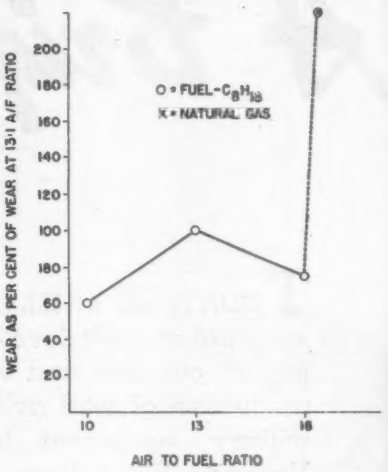

Fig. 1—Wear vs. air-fuel ratio 2½-hp. Lawson engine. Full load

wear values obtained for three mixture strengths, using a motor-car type of gasoline, and a value obtained while using natural gas as a fuel. If we compare these data with the typical composition of the exhaust gas, as shown in Fig. 2, we note

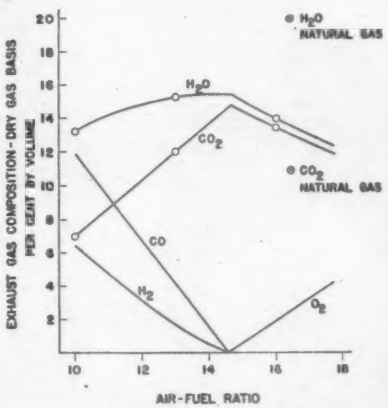

Fig. 2—Calculated exhaust gas composition. Curves are for gasoline C_8H_{17} average composition. Circles correspond to points in Fig. 1

that they correlate excellently with the water content. The results with gasoline could also correlate with the CO_2 content of the exhaust gas, but then a lower wear would be expected for natural gas. That the CO_2 may be responsible for the wear has been advanced as a theory by others, but it has perhaps not been made quite clear that CO_2 could not be expected to be corrosive other than in aqueous solution. Even at the lowest value of CO_2 concentration, enough CO_2 is

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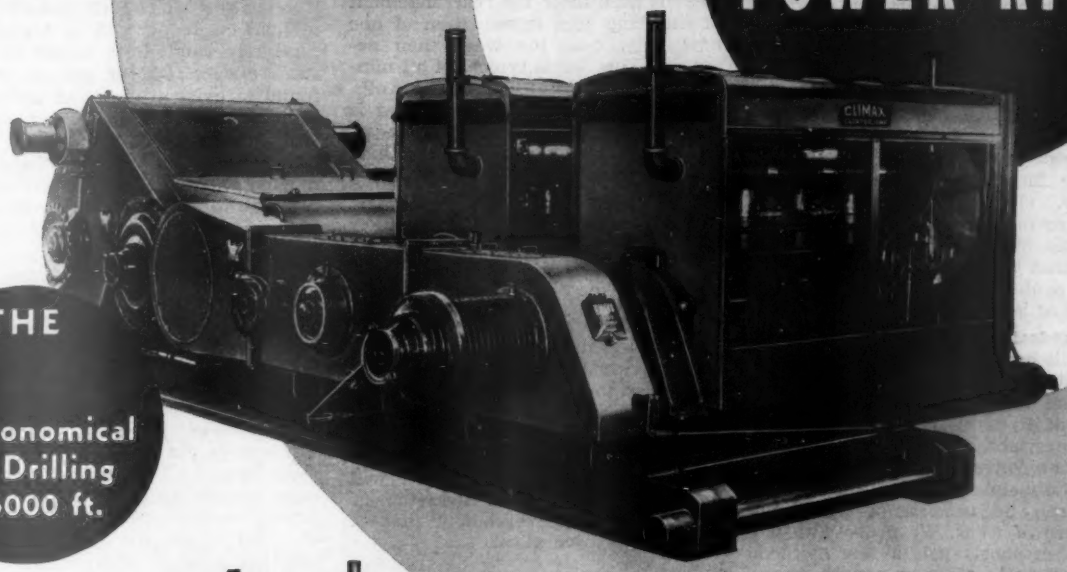

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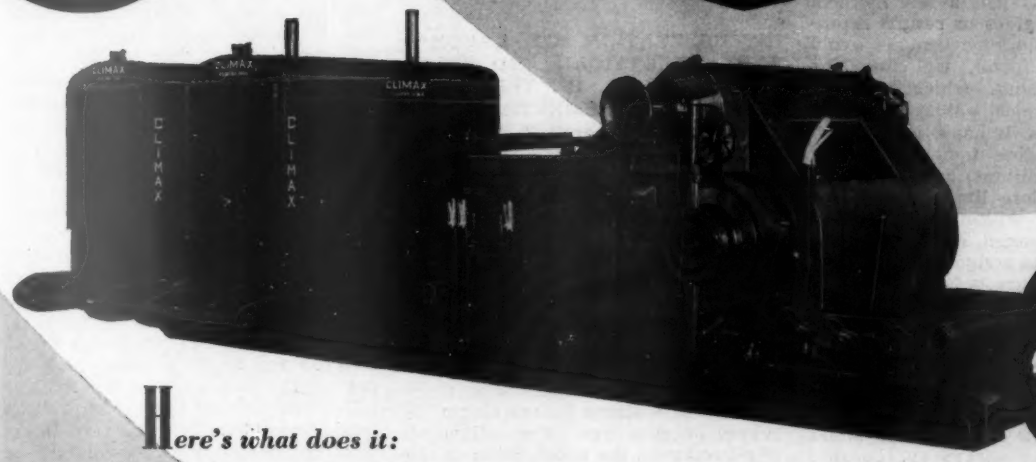

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- Friction clutches for smooth operation.
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- Rig fully enclosed—yet easily accessible.

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present to saturate roughly 100 times the amount of water present. While it is true, therefore, that the CO_2 is the corrosive element, the water constitutes the limiting factor.

Measurement of wear. — In the course of our work we found ourselves faced with erratic test results even when every effort was made to keep conditions constant, and allowance made for the break-in trend. The cause of this irreproducibility can, in principle, lie either in the phenomenon itself or in the measuring technique, the latter being understood to include the whole procedure including dismantling of the engine, cleaning, weighing, piston rings, or making the colorimetric iron analysis. We found from the literature that all other investigators of wear problems have been faced by a similar lack of reproducibility.

Wear test on a CFR diesel engine.— When it becomes necessary, as in the laboratory of an oil company to predict the antiwear properties of oils and additives by engine tests, it is most desirable to have a test available on a conventional engine. In that case the weight loss of the top piston ring can be used as a significant measure of wear. We propose to describe in short such a test method, which usually gives us results reproducible to within 5 per cent. To avoid the distortion factor, we chose the CFR diesel engine, which is much stronger mechanically than most commercial engines. It has a piston with five rings. Engine temperature and operating conditions are controlled within very close limits, the speed, for example, to within 2½ r.p.m. The intake air is cleaned. All engine parts are submitted to a rigorous and exact cleaning procedure before assembly.

In engine operation the top ring always wears considerably more than the lower rings. It is usually necessary to replace the top ring after each test, and in order to have reproducible conditions, a complete new batch of rings is installed. We found this method unsatisfactory, because piston rings, particularly when new, show large differences, and the break-in process is in itself very irreproducible. We overcame this difficulty by setting up a constant supply of well broken-in rings. This consists of discarding the top ring alone after each test and moving the lower rings up. A new ring is placed only in the bottom groove, and it can wear in slowly and reliably during the four tests preceding the one in which it functions as the wear measuring ring. All rings used are plain cast iron, taken from a single lot and heat treatment without surface treatment. All rings are pinned in their groove against rotation as this allows a more rapid and more satisfactory seating-in in the never-quite-circular cylinder. There are many other items requiring close control, most of them familiar to the internal-combustion-engine engineer, for example, piston ring side clearances, piston clearances, and bearing tolerances.

The engine was dismantled every 13 hours for the weighing of the piston rings, which were, however, put back in their former place. Initial wear is high after the rearrangement of the rings and introduction of one new ring, and the wear then decreases. This test is typical of all mineral oils and for some compounded oils. With other compounded oils wear is decreased rapidly at first but the effect is dissipated quickly. Yet others show a more lasting wear-reducing effect, which sometimes even carries over when the lubricant is changed to an uncompounded oil. As the old oil is thoroughly flushed out at the time of such change, this can only mean that the compounded oil has affected the surface of the cylinder liner and piston rings. In a case in which a chemical polishing compound was added to the oil, accelerated wear was experienced, although the surface of the cylinder liner particularly had a highly polished appearance. Other compounds exist which will leave an equally polished surface, but at a wear level below that of the straight mineral oil.

INTERPRETATION OF LABORATORY ANALYTICAL AND VOLUMETRIC DATA IN TERMS OF FIELD MEASUREMENTS.

B. H. Sage, R. H. Olds and W. N. Lacey, California Institute of Technology, Pasadena, Calif.

IN recent years there has been a rapidly growing recognition of the value of laboratory data concerning the volumetric and phase behavior of naturally occurring hydrocarbon mixtures. The decreasing rate of discovery of new oil reserves and the increasing demands upon production require that more efficient and more effective procedures for petroleum recovery be employed. The estimation of oil reserves, the anticipation of the future behavior of reservoirs, and the selection of optimum operating conditions such as proper well spacing, flow rates, and pressure maintenance all depend to a large extent upon accurate information regarding the properties of the materials to be handled. Available correlations and methods for predicting the behavior of multicomponent hydrocarbon mixtures are unreliable in the vicinity of the critical state and in the region of retrograde phase behavior. Many petroleum reservoirs with gas-oil ratios of 3,000 cu. ft. per bbl. or higher and especially condensate fields at pressures above 3,000 lb. per sq. in. are found to exist at states in the region of retrograde phase phenomena not far removed from the critical state. Accurate volumetric and phase data in such cases can be obtained only by recourse to a laboratory investigation of representative samples of the hydrocarbon materials.

The petroleum engineer frequently encounters difficulty in translating the laboratory results into terms which have meaning and value to him in the treatment of field production problems. His difficulty is primarily one of becoming conversant with the nomenclature employed in computing and expressing the data obtained in the laboratory. This discussion outlines in some detail the computational procedures adopted by this laboratory in order to clarify and present for criticism a mode of approach which has developed as the result of several years' experience in this work. Numerical data from an investigation of a typical set of petroleum samples have been included in the tabular forms for the calculations in order to assist the reader should be wish to follow the procedures in detail.

A schematic diagram of a typical surface separator system of a well is given in Fig. 1. The well-production fluid is throttled into the primary or high-pressure separator which is regulated to operate at a constant pressure of about 400 to 500 lb. per sq. in. The gas and liquid phases which appear in the primary separator will be called the "trap gas" and "trap liquid," respectively. The trap liquid is often passed into a secondary or low-pressure separator which is regulated to operate at somewhat less than 100 lb. per sq. in., although sometimes the secondary separator is

(Continued on Page 139)

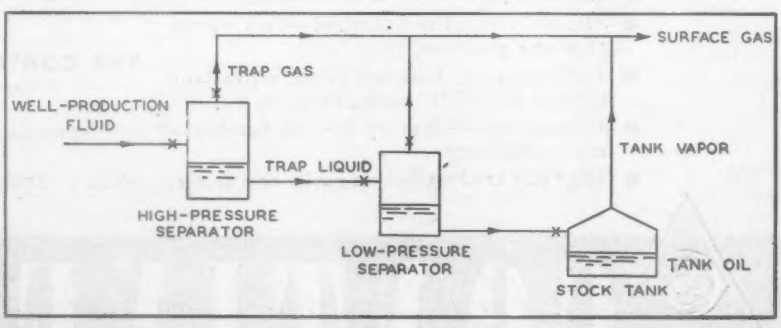
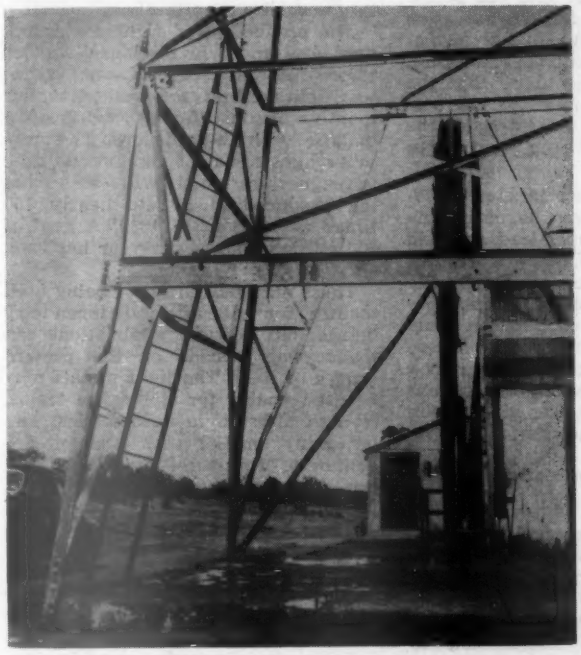


Fig. 1—Schematic diagram of the surface separator system of a well

OPERATING IDEAS

Ladders for Rig-Front Pumping Installations

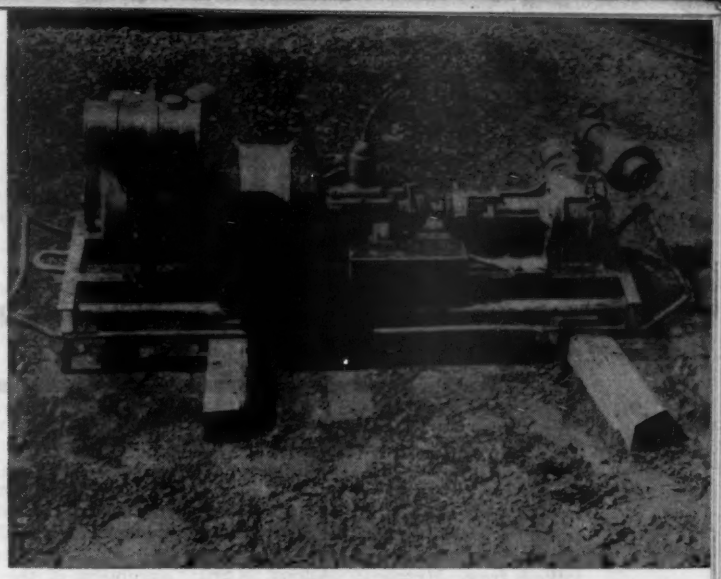
LARGE rig-front pumping installations operated by a major company are provided with a metal ladder to enable the pumper to climb to the pitman bearings and beam head to lubricate and inspect these units without having to "shin" out on the walking beam from the back catwalk. The ladder, when not in use, hangs in one corner of the derrick out of the way. It is supported on a



light line fastened to the top of the derrick, and when needed is swung into desired position without having to be lifted. The ladders were fabricated in the company's shops. Legs were made from discarded piping. Rungs were cut from discarded rods. Each is of welded construction and required less than 3 hours to make and cost between $8 and $12.

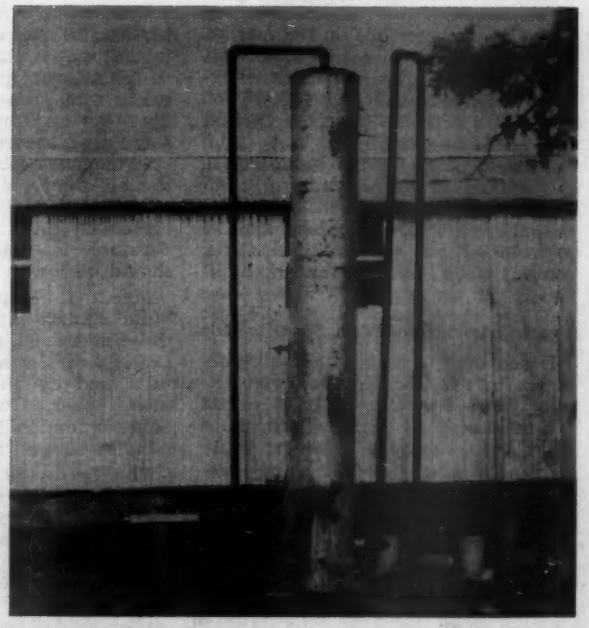
Transmission Unit for Small Rotary Pump

SMALL rotary-pump units used around various leases by one Oklahoma operator have been equipped with drives utilizing transmission units salvaged from old Ford automobiles. The pumps are of a well-known type frequently employed in pickup and light circulating service. Ordinarily these pumps would have a direct drive from a small power unit which would restrict speeds and power to throttling of the prime mover. The transmission unit provides three speeds forward and one reverse, greatly increasing the flexibility in operation of the pump. The reverse speed is of particular advantage should a circulating line become clogged. It permits reversing the pump and back-circulating to clear the line. Speed ratio on the engine in this unit is 3 to 1. The transmission gives a much greater ratio range. In high speed this unit has 45 hp. and develops pump pressure of 500 lb. It has been used in circulating to kill wells, saving the operator moving in a heavy pump. The unit, including pump, transmission and prime mover, all mounted on a single skid, is comparatively light and is moved easily on a light truck or in the back end of a pumper's or tool pusher's car. With the transmission the pump can circulate 80 bbl. of fluid per hour.



Gas Deodorizer Unit for Oil-Field Camp

IN the accompanying picture is a simple treater built by the operator in an Oklahoma field to deodorize gas supplying needs of the operator's field camp. The gas produced has a very objectionable odor. This is effectively removed by the home-made deodorizer. Soda ash solution is used as the deodorant. The column containing the soda ash solution is a section of 20-in. casing, having both ends capped, and set up vertically on a solid base. The 2-in. line carrying the gas to be treated discharges the gas into the base of the column. The gas passes upward, contacting the deodorant, and leaves through an overhead 2-in. line to the camp distribution system.



PROGRESS IN METALS

by W. L. Nelson

Oil Corrosion of Bearings

Abstract—Georgi, C. W., "Oil Corrosion of Bearings," S.A.E. Journal, Vol. 51, pp. 52-62, Feb. 1943. Abstract taken from Metals & Alloys, April 1943.

Twenty laboratories, cooperating in the program of the Bench Test Subcommittee of the S.A.E. Crankcase Oil Stability Research Committee, ran tests on six reference oils in Underwood apparatus, Lauson single-cylinder engines, and in a number of other types of laboratory oil test devices. The six oils used were the B-1, B-2, and B-3 oils from Subdivision B of the S.A.E. Lubricants Division, as used in standardizing the 36-hour Chevrolet engine oil stability test, and the C-1, C-2, and C-3 oils from the Cooperative Fuel Research Fuels and Lubricants Advisory Committee, Chevrolet Engine Test Procedure Group.

Laboratory Tests

In the cooperative work, each laboratory was requested to test the six oils following the test procedures each had used in the past. Standardized test conditions were not set up for any of the bench test methods.

The reference oils represent a good cross-section of the various types and varieties of motor oils on the market. B-1 is a 57-V.I. (viscosity index) oil, containing inhibitor and metal detergent additives. B-2 is a 106-V.I. oil with no additives. B-3 is a 100-V.I. oil, containing inhibitor and metal detergent additives. C-1 is an 88-V.I. oil, containing sulfur inhibitor compound. C-2 is a 92-V.I. oil, containing phosphorous inhibitor compound. C-3 is a 76-V.I. oil with natural sulfur content of 0.37 per cent and no additives.

Bearing Performance in Specific Oils

Based on copper-lead bearing corrosion in the 36-hour Chevrolet engine tests, oils B-1, B-3, C-1, and C-3 are rated as being substantially noncorrosive to such bearings, while B-2 and C-2 are rated as highly corrosive.

The laboratories which ran Underwood tests used a considerable variety of test conditions. Results obtained on corrosion of cadmium bearings indicate that 10-hour Underwood tests at 325° F. with 0.01 per cent Fe_2O_3 as naphthenate, come the closest in rating the corrosion tendencies of the reference oils in line with the 36-hour Chevrolet tests. The single exception is the corrosive rating of oil C-3. This discrepancy may be considered of relatively minor importance since both the Underwood and the Chevrolet engine rate oils of the C-3 type as having limited oxidation resistance both as to sludge formation and acid formation. The essential difference seems to be that the oxidation acids formed are not corrosive to sensitive bearings in the engine but are active on bearings in the bench test.

There is a complete lack of agreement between the results of Underwood tests of copper-lead bearing corrosion and the Chevrolet results. There is also a wide variation in the results reported by the different laboratories which used copper-lead bearings in their Underwoods. These facts indicate that in Underwood tests, cadmium bearing specimens must be used to secure information on corrosion tendencies of oils.

Correlation of Methods

While there was a wide variation in test conditions in the Lauson engine tests, the agreement regarding copper-lead bearing corrosion among the laboratories is quite good and the oils in the majority of the tests are rated in the same order by the Lauson engine as the Chevrolet engine. For evaluating accurately bearing corrosion tendencies in the Lauson engine, the oil temperature should not exceed 280° F. and the test time should be 100-120 hours. If high coolant temperature is used, oil temperature should be lower.

MacCoyll corrosion tests appear quite similar in over-all ratings to the Underwood tests. Correlation of bearing corrosion by strip corrosion tests and by the Chevrolet engine seems poor. Corrosion ratings by Sohio oxidation tests are not differentiated as well as they might be.

The Series 30 Ethyl engine tests show essentially no difference in corrosion tendencies between the six reference oils. Babbitt bearings are probably used in this engine so that corrosion tendencies are not intended to be evaluated.

Light Metals—Heritage Of War

If war has beneficial heritages, they are mainly of a material nature—the product of greatly stimulated scientific research. Among such heritages, the greatly increased production of light metals by the pressure of military necessity is certainly noteworthy.

The production of sufficient aluminum was an early bottleneck in our efforts to produce aircraft—not by insufficient facilities for production, but mainly by insufficient supplies of bauxite or high-grade ore. The only other light metal of commercial note is magnesium which will (or is) being produced at a rate nearly 100 times as large as in 1939. A goal of 700 million pounds per year has been set.

These materials are now being used mainly for aircraft and incendiary bombs, but postwar applications can make deep inroads on the present usages of steel. The light metals may be used widely for streamline trains, civilian aircraft, in automobiles, and for many smaller uses such as gas cylinders, furniture, etc. It is not probable that peacetime demand can support the grossly swollen output of the aluminum and (particularly) magnesium industries but the most efficient plants or operations will continue and these will be able to supply light metals at a cost lower than those heretofore asked.

There appears to be a golden opportunity to utilize the light metals for many small articles.

Nonsparking Metals

The hazard of explosion or fire in the petroleum industry makes the sparking tendency of metals of vital interest. Some of the copper-base alloys, notably beryllium copper, are well known because of their nonsparking properties but little information is available about other metals. The sparking tendencies of a number of materials was discussed in Process Industries Quarterly (Vol. 7, No. 3) of the International Nickel Co., in somewhat the manner given below.

Completely nonsparking. — Some pure metals, particularly those with

low melting points, such as aluminum, tin, copper and lead.

Nonsparking.—Certain copper-base alloys such as beryllium-copper and aluminum bronze are for most purposses classed as nonsparking.

Low-intensity sparks.—Sparks not hot enough to readily ignite gunpowder, gasoline or highly combustible gas mixtures, are produced by certain nonferrous alloys such as monel metal.

Spark producing.—As the iron content of an alloy increases the tendency to produce dangerous sparks also increases. The increasing tendency to produce "hot" sparks, is illustrated by the following listing of materials, each of which exhibits an increasing tendency to produce sparks—Inconel (6 per cent Fe), high Ni-Cr steel (23 per cent Fe, 60 per cent Ni, 15 per cent Cr), stainless steel (50 per cent Fe, 35 per cent Ni, 15 per cent Cr) and stainless steel (18-8 Cr, Ni).

Hot or intense sparks—Carbon and low-alloy steels produce sparks that will ignite many explosive mixtures.

Abstracts

(Continued from Page 134)
omitted and the trap liquid delivered directly to the stock tank at approximately atmospheric pressure. The combined gases from all stages of separation will be called the "surface gas" in this discussion, and the crude oil in the stock tank will be called the "tank oil." These should be distinguished from "plant-product" gas and oil.

Samples of the trap gas, trap liquid, and tank oil are analyzed by fractional distillation, and their compositions are reported in terms of the weight fractions or mol fractions of the light paraffin hydrocarbons from methane through heptane, all heavier components being lumped into a single constituent called "octanes and heavier." In addition to the compositions of the samples it is desirable to know the specific gravities at standard surface conditions (60° F., 14.73 lb. per sq. in. abs.; hereafter designated by S.S.C.) of the tank oil and of the octanes-and-heavier residue from the fractionation analysis of the trap liquid, together with the average molecular weight of this residue.

At the time of sampling, the following observations of the well operation are required:

1. Static pressure and temperature in the well at the producing horizon.
2. Rate of production of surface gas.
3. Rate of production of tank oil.

In the laboratory study of a system the samples of trap gas and trap liquid are combined in various proportions, and the volumetric and phase behavior of the resulting mixtures is experimentally determined. The correlation of the properties of these arbitrary mixtures with the particular mixture of trap gas and trap liquid which corresponds to the well-production fluid requires that the equivalent gas-oil ratios of the mixtures be known. The procedure for obtaining this information is outlined below.

The principles of elementary stoichiometry are employed with the assumption that the octanes-and-heavier portion of the trap liquid preserves its identity in the subsequent stages of separation and appears without loss in the tank oil. Experience in the study of systems of this nature has shown that the error occasioned by this assumption is negligible in comparison with uncertainties from other sources such as the observation of production rates, the procurement of representative samples, and the analyses of the samples.

Equations are presented from which can be derived:

1. The composition of a mixture of trap gas and trap liquid.
2. The weight and volume of tank oil per pound of mixture.
3. The weight and volume of any component in the gas constituent.
4. The volume of the gas constituent per pound of mixture and the gas-oil ratio.
5. The ratio of the formation volume to the specific volume where the formation volume is defined as the number of barrels of mixture which yields 1 bbl. of tank oil at S.S.C.

A series of equations is also presented showing the relationships of plant-product oil from refinery processes and for computing the relationships of trap samples.

PRESSURE DROP FOR TWO-PHASE TWO-COMPONENT FLOW IN A HORIZONTAL PIPE. R. C. Martinelli, University of California; T. H. M. Taylor, Cutter Laboratories; E. G. Thomsen, E. H. Morrin and L. M. K. Boelter, University of California.

THE pressure drop accompanying the two phase, two-component flow of air and eight various liquids, including benzene, water and S.A.E. 40 oil, was measured for flow conditions varying from all air to all liquid in a 1-in. glass pipe and a ½-in. galvanized iron pipe. The flow patterns existing at the various flow rates were studied visually and photographically. A macroscopic analysis of the flow phenomenon is presented which allows the prediction of two-phase, two-component pressure drop under certain flow conditions. The application of the proposed method to the prediction of pressure drop along a pipe in which a fluid is evaporating, is tentatively outlined.

Conclusions.—Although the microscopic details of two-phase, two component flow are very complex it is possible to predict, with an accuracy of less than ±30 per cent, the pressure drop for two-phase, two-component flow under the following conditions: (a) Both the liquid and gaseous phases must be in turbulent flow. (b) The pressure drop for the gaseous phase alone, in the pipe, must be known, and this pressure drop must be low enough to allow the omission of compressibility effects.

An equation for the prediction of two-phase, two-component pressure drop when both fluids are flowing viscously has been presented, but has not been verified experimentally.

The case of mixed flow, i.e., the fluid flowing viscously and the gas turbulently, requires further study.

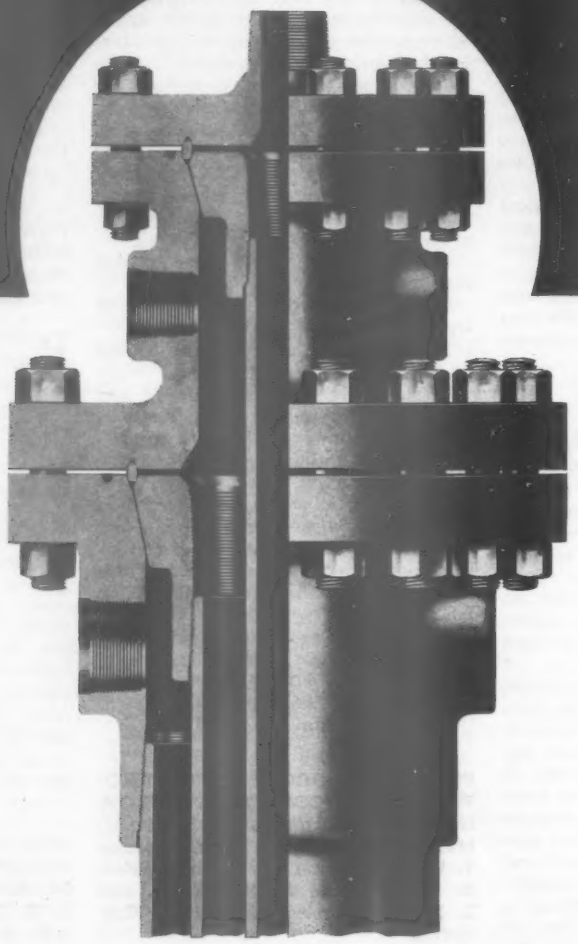
PORTABLE DRILLING AND WELL-SERVICING EQUIPMENT. James Moon, Franks Manufacturing Corp. and Hillman-Kelley, Inc.

PORTABLE equipment (1) saves rig-up and tear-down time as the portable mast or derrick is power-raised and the tear-down time is less; (2) the derrick, crown block, draw works and power plant in a completely unitized machine are part of the service unit; (3) lines and blocks can be carried strung at all times, including the over-the-road travel; (4) open-face tilted design permits greater block clearance with more room around the well head or rotary table; (5) the portable derrick can be left standing full of tubing in the field while the hoist is used under a standard derrick or with other equipment; (6) may be used as either a servicing machine for the deepest wells or for rotary drilling by the use of the rotary drilling atachment.

REQUIREMENTS FOR RELIEF OF OVERPRESSURE IN VESSELS EXPOSED TO FIRE. J. J. Duggan, C. H. Gilmour and P. F. Fisher, Carbide & Carbon Chemicals Corp.

PRESSURE vessel codes and regulations prescribe pressure-relief equipment but no not completely specify the necessary relief capacity to ensure safety. Investigations show that the most effective cause of pressure increase is fire exposure, as encountered in accidental conflagrations, and tests of the effects of such fire exposure on pressure vessels have been made and analyzed. Part 1 of the paper details these tests and analyzes the results. Parts 2 and 3 develop the necessary formulas to determine the sizes and capacities of the relief connections and apparatus and also present detailed statements of the applications of these formulas to pressure vessels and atmospheric tanks.

NO PACKING HERE
TO LEAK OR BLOW OUT—



Most operators have experienced packing trouble in mechanical equipment. It might be a minor leak causing temporary shutdown. It might be a blowout causing a million-dollar fire. But packing, despite its vital place in oil field equipment, has always been a source of trouble.

In this casing head-tubing head combination we have no packing, and the users therefore have no packing trouble. The pressure sealing medium is a ground joint seat (steel to steel). A single API iron seal ring, supplementing the ground joint seat, acts dually as a perfect pressure sealing medium and mandrel hold-down. And the mandrel hanger cannot wedge in the body.

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SLOW START SAVES PUMPING COST

IN the Seminole area an investigation of pump repair operations showed that excessive pump repair costs persisted in a number of wells—despite the type or make of pumps installed over periods of several months. A further study of pump-trouble data brought out the fact that a large majority of pump failures was due to sand abrasion.

The following chart shows the pump life obtained in a Seminole well. The inconsistent life and the extremely short runs are typical of the group of wells investigated.

If it were reasonable to assume that the abrasive condition of the well changed as often as new pumps were installed, there would be no grounds for investigation. However, when it is considered that the various types of pumps shown on the chart were operating at the same depth, handling approximately the same amount of fluid from the same horizon during the 28 months, it appears that considerable effort to obtain longer pump runs might be justified.

Obviously there are factors responsible for the variation in pump life in these wells (represented by the chart) other than the type of pump used. The extremely long run of 272 days obtained with pump Brand C was not approached by other more expensive types of pumps. The rather common expression that a certain make and type of pump is required for efficient operation of each individual well was not substantiated by the chart records obtained showing the life of various types of pumps.

Possible Procedure for Obtaining Longer Pump Life

Two operational stages in servicing and pumping of wells should be investigated for possible influencing effect they may have upon the life of pumps, as far as damage due to abrasion is concerned.

1. In some cases, the time elapsing between unseating of the pump and the installation of a new one is not long enough to permit the fluid (previously agitated by unseating the pump) to clear up. Where the life of a pump has been outstanding among a large number of extremely short runs, it is possible that, for some reason, the well was allowed to remain down for a sufficient period of time to permit the sand to settle out.

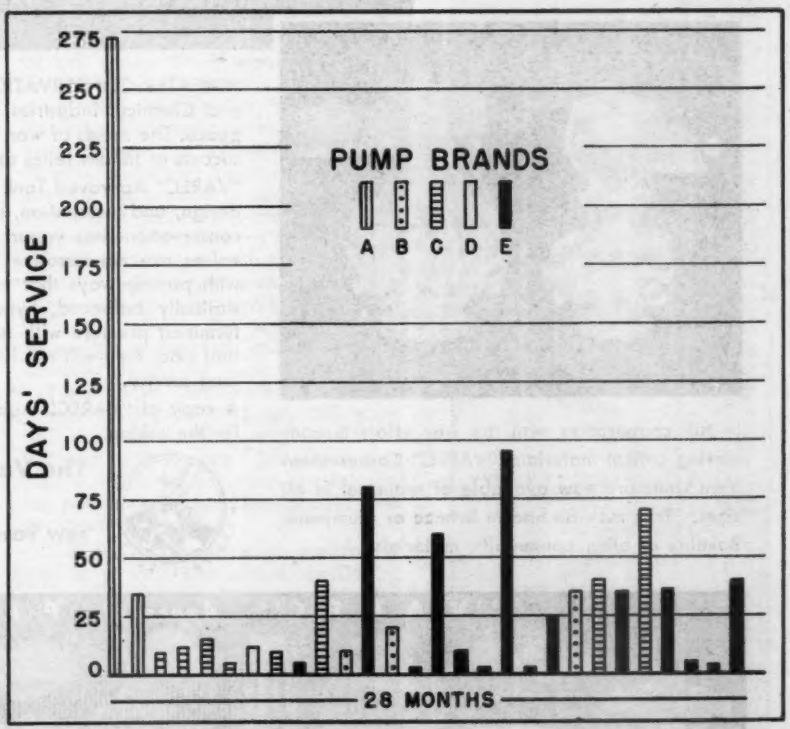
2. Often, after a pump has been installed, it is operated at a rate of speed much higher than the normal cycle in order to pump up quickly. In these cases, the increased movement of tubing, in addition to the fast rate of withdrawal, enough sand may be pulled into the pump to shorten its life. This is possible even if the well were permitted to stand long enough to allow the sand to settle out of the fluid previously agitated when unseating the pump.

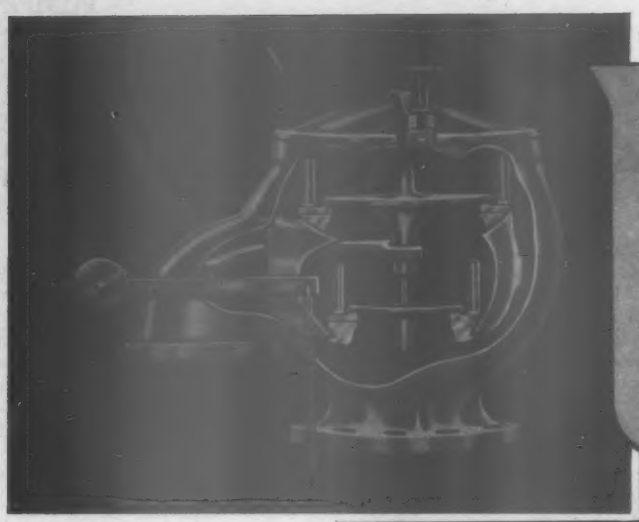
When a pump is unseated in a Seminole well, the fluid in the tubing is released in the bottom of the hole at an initial pressure of approximately 1,400 lb./in.^{2} The time required for the sand to settle may vary, depending upon the characteristics of the well. It may be necessary in some cases to leave a well down 12 to 24 hours to permit the sand to settle.

After allowing the well to stand, when starting up, it appears advisable to begin at a much slower motion than normally employed. When a well has been permitted to stand, the fluid level, of course, is higher than it is when the maximum well capacity is being handled. Particularly, if a well is tubed close to bottom, there is more chance of sand being swept into the pump when the fluid level is high.

Assuming that the second pump shown on the chart could have been made to run as long as pump No. 1 (which ran 272 days), 13 pump jobs could have been prevented. The saving in pump repair cost and pulling operation on these pumps would have amounted to $884; and in addition to this the revenue from the well would also have been higher due to a more constant rate of operation.

This would offset any objection which might arise concerning production which would be "lost" if a well were allowed to stand idle for several hours and then started up slower than the normal cycle. After reducing the fluid level in a well which has been permitted to stand, the operating speed can be gradually increased until the normal cycle is reached.





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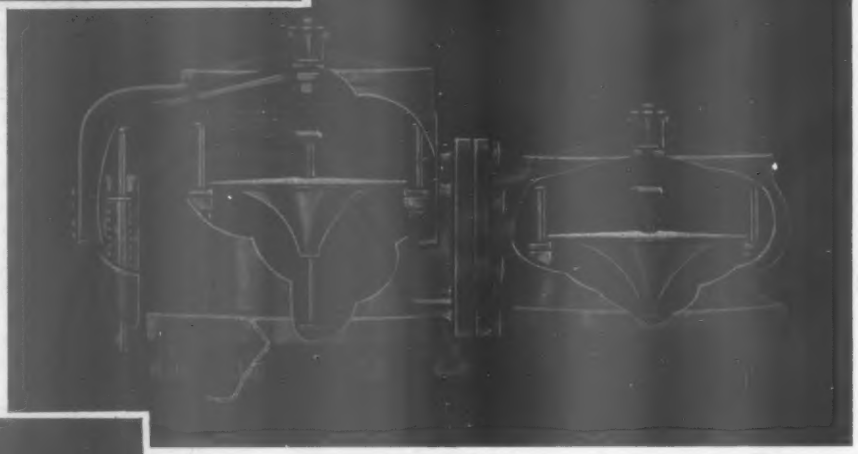
Greater CONSERVATION *Less* VAPOR LOSS

Above: Cutaway section view of the "VAREC" Figure No. 20SA Conservation Vent Valve with Flame Snuffer, 2 to 6 Inch Sizes.

Right: Cutaway section view of the "VAREC" Figure No. 20SA Conservation Vent Valve with Flame Snuffer, 8 to 12 Inch Sizes.

Below: "VAREC" Figure No. 20SA Series on a "VAREC" Approved Flame Arrester. This combination unit is Figure No. 58SA.



In full cooperation with the war effort in conserving critical materials, "VAREC" Conservation Vent Units are now available of semisteel in all sizes. Trim may be had in bronze or aluminum, Bakelite or other nonmetallic materials.

"GREATER CONSERVATION". On this Cornerstone of the Petroleum and Chemical Industries depends our ability to secure and hold the peace. The needs of war have brought home to us the realization that success or failure relies on the "greatest use of what we have".

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Engineering Fundamentals

No. 93

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL

STANDARD DEPTH PRESSURE GAGES*

THERE are two depth-pressure recording instruments which are patented and manufactured under license of Standard Oil Co. of California. The first instrument developed by them is designated as the 125 series, while their latest instrument is designated as the 750 series.

The 125 Series

The 125-series gage is illustrated in the cross-sectional drawing of Fig. 1. The development of this gage was begun in 1929. The instrument is 6½ ft. long and weighs about 25 lb. The standard diameter of the gage is 1¼ in. A special size of 1⅛-in. diameter is available.

The gage operates on a very simple principle. Well pressure is admitted through the "pressure-inlet port" near the bottom of the gage and acts against the "actuating piston" forcing it upward against the tension of the "tension spring." As shown in Fig. 1, four interchangeable spring assemblies, having maximum pressure ranges between 250 lb./in.^{2} and 3,000 lb./in.^{2}, are available. This makes possible the obtaining of accurate readings at low pressures but still allows reading of pressures up to 3,000 lb./in.^{2} The piston and springs are so designed that an extension of 5 in. is obtained when reading the maximum pressure for which each spring is intended. The same piston diameter is used for all springs.

In effect the piston is attached to the upper (free) end of the spring, while the lower end of the spring is rigidly attached to the main body of the gage.

The vertical movement of the spring is recorded by a stylus, attached to the upper end of the spring, on a sensitized paper or thin metal chart inside the "recording drum." The recording drum is rotated by either clock-work or a thermally operated motor. The thermal motor is a unique feature of the gage. It consists of a double bimetallic helix, one end of which is attached to the case and the other to the drive shaft. Changes in temperature (as would normally occur in running a gage from the surface to some depth) cause of rotating motion of the helix which is transmitted to the recording drum. Heat transfer to the thermal motor is delayed by insulation which makes possible the recognition of stops in a well due to the period allowed for equalization of temperature between the well fluid and the helix. In wells where temperature changes with depth are insufficient to cause response from the thermal motor, a clock should be used for rotation of the recording drum.

A socket, for attaching a small-diameter wire line in order to lower the gage into a well, is provided at the top. This socket is grooved on the outside to fit a ⅝-in. sucker-rod socket as an aid in recovery of the instrument if it is lost in the well.

The "C-Cup pressure seal," near the bottom of the gage, seals around the piston and prevents entry of well fluid into the spring and recording section from below. The "pressure joint" just above the "drum-turning device" prevents entry of well fluid at the top of the section.

Calibration

The instrument can be calibrated by a procedure essentially the same as that described in Installment 86 of this series. Each spring should be calibrated at a minimum of four temperatures covering the range of expected well temperatures. Some consistent means of vibrating the gage, both laterally and longitudinally, during the calibration process is recommended in order to obtain a finely accurate calibration. The vibration should be of such nature as to duplicate on the pressure chart, as nearly as possible, the vibration obtained on a well chart. For a high degree of accuracy, frequent checks on calibration should be made.

Tests have indicated that with proper calibration and care this gage will produce readings with less than 0.25 per cent of error. To obtain this high a degree of accuracy, the following additional suggestions should also be observed:

1. Before calibrating or making a test in a well, the piston should be worked back and forth against the spring tension several times in order to lubricate the sealing cup and assure smoothness of movement. Any tendency of the piston to bind or move

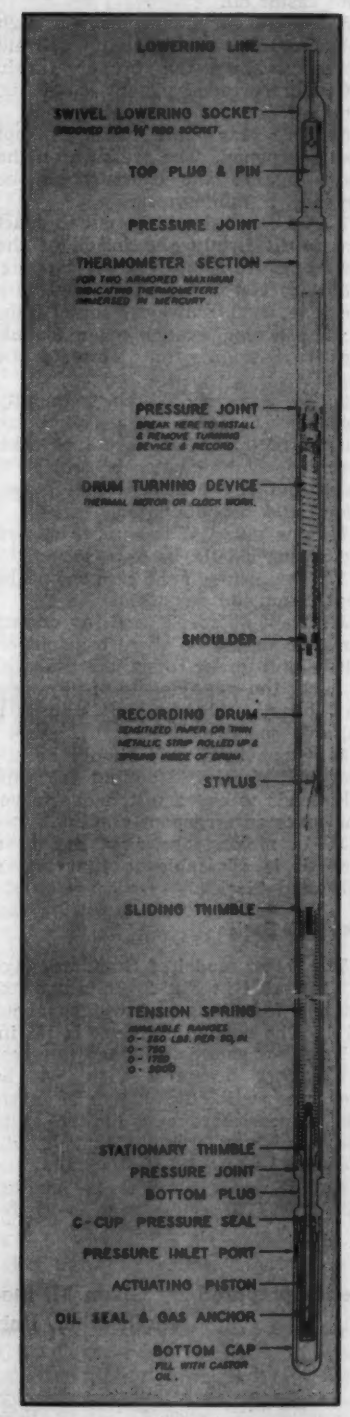

Fig. 1—Standard 125-series gage

*Other leading makes of subsurface pressure gages have been described in Installment 89 of this series.

erratically should be eliminated before making a test.

2. When calibrating, the zero line should be drawn with the gage at atmospheric temperature, rather than at some elevated bath temperature.

3. The piston and spring shaft should be kept straight and handled with care.

4. The bottom cap should be kept filled up to the pressure-inlet port with castor oil.

5. The piston should have a high polish. Use of a crocus cloth will aid in maintaining the proper finish. Pitted or corroded pistons should be replaced.

6. The stylus point should be kept well sharpened. The pressure on the stylus against the chart should be kept at a minimum.

7. The chart should be cut to exact size to fit firmly the inside of the recording drum without overlapping.

8. A special wrench, furnished with the gage, should always be used rather than a pipe wrench when loosening or tightening the joints of the gage.

9. The gage should be frequently inspected to insure that all bolts, nuts, screws, and joints are kept tight.

10. The chart carrier is subject to wear, and any looseness that develops should be eliminated.

11. The guide at the upper end of the spring should be kept smooth.

12. The inside of the case should be kept clean and smooth.

13. The line speed used in running the gage should be about constant on all wells in order to subject the gage to about the same degree of vibration on all tests. About 800 ft./min. is a suitable speed.

14. Stops in a well should be approached slowly. Stopping too rapidly tends to cause piston overtravel and gives an erroneous reading.

15. In making the first run in a well, it is advisable to first run a full-sized "feeler."

The 750 Series

The latest model of Standard gage is illustrated in Fig. 2. It is approximately 7 ft. long and weighs about 26 lb. The outside diameter is 1¼ in.

This new gage is designed to measure higher pressures than can be measured with the 125-series gage. The 125-series gage is limited as to the maximum pressure that it will measure because of the fact that the piston is under compressive loading. The new (750-series) gage is so designed that the piston is not subjected to this compressive load.

The well pressure enters through the "pressure inlet" near the bottom of the gage and actuates a free-moving piston in the "oil tube." Thus, the well pressure is transmitted to castor oil with which the spring section of the gage is filled. The pressure of the castor oil actuates a piston which is attached to the upper end of the spring and extends upward through the "C-cup pressure seal." The force tending to move the piston upward is equal to the area of the piston times the differential pressure between the spring chamber and the clock chamber; while the restraining force on the piston is the tension in the spring to which the piston is attached. Thus the upward movement of the piston is proportional to the well pressure, as was the case with the first gage described.

Other features of the gage, such as the recording drum, the drum-turning device, the thermometer section, lowering socket, etc., are essentially the same as described for the 125-series gage.

This gage will measure pressures up to 7,500 lb./in.^{2} Two ranges of springs are available: 0 to 5,000 lb./in.^{2}, and 0 to 7,500 lb./in.^{2} Special springs of lower range can be obtained or the 125-series gage can be used in wells having maximum pressures below 3,000 lb./in.^{2}

Using proper care, pressure readings accurate within 0.25 per cent can be obtained. The suggestions made for obtaining a high degree of accuracy with the 125-series gage also apply to the 750-series gage. Additional suggestions of value in the use of the newer gage include:

1. A polished rod of exactly 0.250 in. diameter should be used for testing the "C" cup. Any cup which shows light between its lip and the rod should be discarded. Any cup which fits so tightly that it will not move freely on the rod when lubricated should be stretched on a rod 0.002 to 0.003 in. oversize.

2. When assembling instrument, drop a little oil on the upper end of the piston so that it will run down and lubricate the inside edge of the "C" cup packing ring.

Other detailed instructions concerning breaking down, assembling, and filling with castor oil are furnished with an instrument.

Fig. 2—Standard 750-series gage

Series prepared by Glenn M. Stearns, associate professor of petroleum engineering, University of Oklahoma

Natural Gasoline

Output of Light Products Continues to Increase

WASHINGTON, D. C.—Daily production of natural gasoline and allied products increased in April to 10,039,000 gal., compared with 9,968,000 for March and 8,760,000 for April 1942, the Bureau of Mines reported last week.

East Texas and California showed pronounced increases over March, while Illinois, the Texas Panhandle, and the Louisiana Gulf Coast registered smaller gains. For the first 4 months, the Texas Gulf Coast and East Texas districts increased 13 and 10 per cent, respectively, over the totals for the same period in 1942.

Natural gasoline showed a larger relative increase in production than the other light products, in fact, the daily average output of cycle products declined.

Refinery demand for cycle products and liquefied petroleum gas increased but because of seasonal influences the demand for L.P.G. and liquefied refinery gases as fuel declined.

PRODUCTION AND DISTRIBUTION OF LIGHT PRODUCTS IN UNITED STATES
(Thousands of gallons)

	Apr. 1943	Mar. 1943
Stocks—first of month	244,734	224,868
Production:		
Natural gasoline	162,792	161,574
Cycle products	54,096	59,010
Liquefied petroleum gases:		
Isobutane at natural-gasoline and cycle plants	12,474	13,398
Other L.P.G. at natural-gasoline and cycle plants	71,820	75,012
Liquefied refinery gas	15,456	15,582
Benzene	8,400	8,400
Total supply	569,772	557,844
Stocks—end of month:		
Natural gasoline	174,594	178,164
Cycle products	16,086	18,648
Liquefied petroleum gases:		
L.P.G.	37,170	32,592
L.R.G.	16,422	15,330
Total stocks	244,272	244,734
Demand:		
Used at refineries:		
Natural gasoline	129,822	133,812
Cycle condensate	40,824	35,826
Liquefied pettroleum gases	38,766	36,456
Natural gasoline and cycle condensate to jobbers and retail outlets	23,730	24,108
Liquefied petroleum gases for fuel:		
L.P.G.	31,710	37,338
L.R.G.	14,364	15,288
Transfers of cycle products	6,090	4,578
Exports and losses	40,194	25,704
Total demand	325,500	313,110

Production Rate Slumps 3,000 Bbl. Daily in Texas

AUSTIN, Tex.—The yield of condensate, natural gasoline, butane-propane and other similar products in Texas declined to 116,269 bbl. daily in April, the Railroad Commission reported here last week. Output in March average 119,343 bbl. daily.

Increases of 1,319 bbl. in the daily production of natural gasoline and of 625 bbl. in the average output of "other" products were more than offset by declines of 2,423 bbl. in condensate and of 2,495 bbl. in reported yields of butane and propane.

April output of condensate, natural gasoline and related products was the lowest reported for the year.

Part of the decrease in butane and propane production can be accounted for by the increase in volume of natural gasoline, indicating employment of less severe stabilization.

The decrease in production of condensate may be attributable to reduced production rates in certain areas where this phase of operations would be thereby affected. Furthermore, tighter restrictions are being imposed from time to time on recycling plant operators unless their facilities are qualified to return residue gas to the formation, or consumed in some other manner contributing to the war program.

NATURAL-GASOLINE PLANT OUTPUT
(Barrels daily)

	March	April
Condensate, crude	246	106
Gasoline	56,469	59,348
Butane-propane	14,035	12,010
Other	1,093	1,089
Total	71,483	72,553
Recycling-Plant Summary (Barrels daily)		
Condensate, crude	13,393	12,678
Gasoline	16,408	14,872
Butane-propane	3,424	2,854
Other	3,229	3,858
Total	36,454	34,262
Pressure Maintenance		
Condensate	428	244
Gasoline	67	43
Total	495	287
All Operations		
Condensate	24,618	22,195
Natural gasoline	72,944	74,263
Butane-propane	17,459	14,864
Other products	4,322	4,947
Total	119,343	116,269

Natural Gas Developments

Natural Gas Section of A.G.A. Will Meet October 11

NEW YORK.—The Natural Gas Section of the American Gas Association will hold its phase of the general association's annual meeting in St. Louis, Mo., October 11. The general meeting will embrace 3 days, October 11-13.

St. Louis was selected by the executive board of the association as the city nearest the center of the organization's membership affording adequate accommodations, resulting in conservation of time and travel.

Raigorodsky Resigns From PAW Natural Gas Division

WASHINGTON, D. C., June 19.—The resignation of Paul M. Raigorodsky, assistant director of the Natural Gas and Natural Gasoline Division, was accepted today by Petroleum Administrator for War Harold L. Ickes, the resignation is effective July 1.

Mr. Raigorodsky will return to the oil-business activities in which he was engaged before he joined the PAW in September 1941. No one has been named to succeed him at PAW.

In accepting the resignation, Administrator Ickes said:

"Though Mr. Raigorodsky finds it necessary at this time to return to private industry, I know that he will continue to serve his country usefully as an able technician in natural gas and natural gasoline."

Mr. Raigorodsky has been on leave of absence as vice president and general manager of Petroleum Engineering, Inc., and the Glen Rose Gasoline Co., both with offices in Tulsa and Houston, Tex.

Widely known for his work in designing natural-gasoline and cycling plants and in improving their operations, Mr. Raigorodsky, while with these companies, was responsible for the successful completion of more than 200 different projects for major and independent oil companies in the United States, France, Russia and other foreign countries.

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Above: HORTONSPHEROIDS are widely used for storing high pressure blending stocks for aviation gasoline. The above 10,000-bbl. unit, located in a gulf coast state, is used to store natural gasoline.

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REFINING

E. F. Greiner Supervising Canadian Plant Additions

Installation of new facilities at Pacific Oil & Refining Co. of Alberta's plant at Lethbridge is now under the supervision of E. F. Greiner, who has arrived at the Canadian plant site and assumed duties of refinery superintendent. Mr. Greiner formerly was employed in California.

The Pacific Oil & Refining plant was acquired from Huff Refining Co., Ltd., and is being enlarged and modernized to process 1,200 bbl. of crude daily. The refinery will operate on Taber field crude blended with lighter oils from Twin River and Del Bonita.

British-American Oil Co. will take the gasoline and distillate output of the Pacific plant, and fuel oil will be sold to the Canadian Pacific Railway.

Officers of the new refining company are: S. Myron Zandmer, president; Frank Ruber, W. P. Blackert and B. S. Parkinson, directors.

Kendall Plant Suffers Slight Damage by Fire

BRADFORD, Pa.—Limited damage to facilities was suffered here last week at Kendall Refining Co.'s plant when an electric-current failure resulted in a flash fire in one of the fractionating units.

A company spokesman said the extent of the damage could not be immediately determined but he added that he "did not think it would amount to a great deal."

A break in the electric circuit caused an increase in temperature, ruptured tubes from which hot naphtha escaped, ignited and enveloped a 40-ft. tower.

Rubber Production to Start at Canadian Plant

OTTAWA, Ont.—Announcement has been made by C. D. Howe, Canadian minister of munitions and supply, that the synthetic-rubber plant of the government-owned Polymer Corp. at Sarnia, Ont., will be in partial production some time in August.

Units for producing butadiene were delayed because of the difficulty of securing certain materials. In order to bridge the gap, the government plans to secure butadiene from the United States, permitting the plant to start operating at 25 per cent of capacity at the end of August. The first butadiene unit should be completed in September and the second in October, with the entire enterprise, in which the government has invested between $40,000,000 and $45,000,000, in full operation by the early part of 1944.

Canada's normal rubber requirements are between 30,000 and 35,000 tons annually. The Sarnia plant is designed to produce 37,000 tons of buna-S rubber and 8,000 tons of butyl rubber.

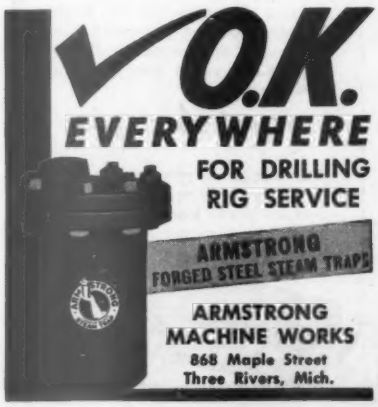
After the war, the government plans to continue operation of the plant, selling the output to Canadian rubber companies.

Canada had substantial stocks of crude rubber on hand when Japan entered the war, as well as some 21,000 tons at Singapore and Penang awaiting shipment, practically all of which ultimately reached Canada.

PIWC Appoints Four Men To Refinery Committee

WASHINGTON, D. C.—Four new members have been appointed to the general committee on refining for the Petroleum Industry War Council, it was announced here last week by William R. Boyd, Jr., chairman of the council.

New members are Harry A. Logan, president of the United Refining Co., Warren, Pa., and also president of the National Petroleum Association; C. L.



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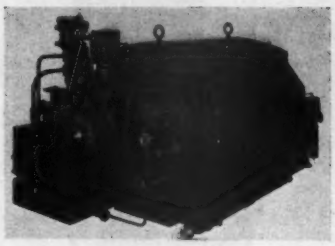

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Henderson, president of the Vickers Petroleum Co., Wichita, Kans., and president of the Western Petroleum Refiners Association; F. E. Holsten, vice president of Chalmette Refining Co., New Orleans, La., and president of the Gulf Coast Refiners Association, and C. A. Johnson, president of the Socal Oil & Refining Co., Huntington Beach, Calif., and president of the Independent Refiners Association of California.

Appointment of the four presidents of refiners' associations on the PIWC committee was in response to demand for greater representation for independent segments of the manufacturing branch of the industry and to a desire by the national organization to have counsel of these spokesmen in shaping over-all recommendations.

War Financing in Oil, Coal And Chemicals Reported

WASHINGTON, D. C.—Expenditures for petroleum, chemical and coal war-industry facilities at the end of March stood at $1,969,000,000, the War Production Board reported last week. Of the expenditures allotted for facilities in this field, $665,000,000, or 34 per cent, was privately financed and the remainder is covered by public funds.

Greater Capacity Sought For West Texas Crude Line

Possible methods of increasing the quantity of crude oil to be transported in the 16-in. pipe line which the War Production Board has authorized the Stanolind Pipe Line Co. (Standard of Indiana) to construct between Sundown, Tex., and Drumright, Okla., continues to be discussed this week in refinery and pipe-line circles. It is understood that specially prepared reports and recommendations were presented last week at a meeting of the PAW general committee for District 2 in Chicago, Ill.

At the meeting it was generally agreed that more crude oil or products or both would have to be brought into District 2 from District 3 over the last 6 months of this year and next year to take care of the assured demands. Some refineries in District 2 are short of crude oil at this time and due to the decreasing crude-oil production trend of the entire district other plants will be short of their requirements later in the year or early in 1944.

It is due to this situation that many have urged that the capacity of the 16-in. line be increased to 18 or 20-in. It is understood that the Stanolind company which is financing the line without government aid would not be interested in enlarging the line which was approved by the Government as 16-in. carrier. Regardless of whether the capacity of the line from the West Texas fields to Drumright is increased it is believed certain that a program of building a smaller line from Drumright to St. Louis or some other Mississippi River point will be approved. The 16-in. line is scheduled to start in October and be completed March 1944.

Synthetic-Rubber Tires May Outlast Automobiles

CHICAGO.—The motorist of the future instead of buying a new set of tires for his car may buy a new car for his tires, in the opinion of Dr. Gustav Egloff, director of research of Universal Oil Products Co., who spoke before the Southern Ohio Postwar Conference of the National Association of Manufacturers, at the Gibson Hotel, Cincinnati, Ohio, June 21.

This is because the tires will be made of synthetic rubber, designed by man to meet exact specifications and produced from petroleum in American refineries.

The development of the synthetic-rubber industry in the war is showing us how to make ourselves independent of foreign sources of supply and to make rubber available at low cost for a vast number of uses to which it has not yet been applied.

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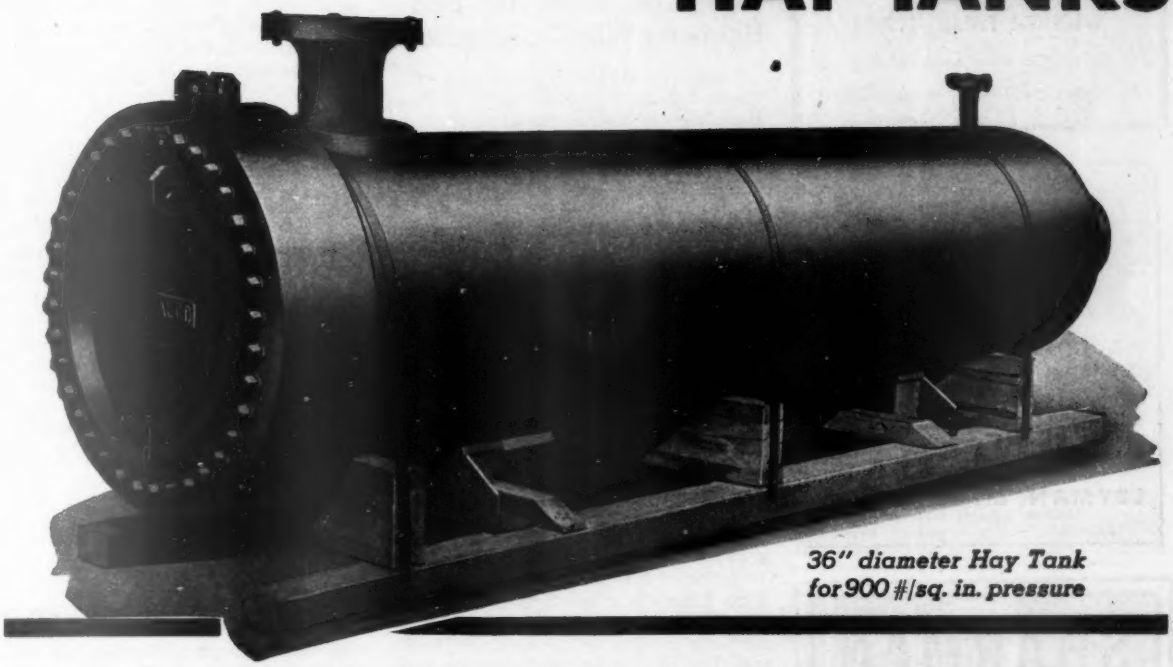

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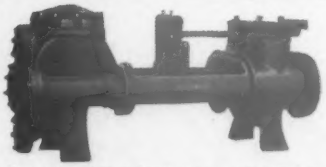
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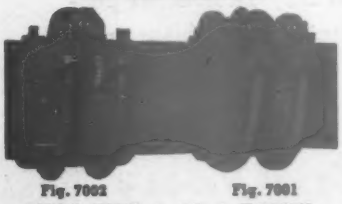
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PIPE LINES

Jones Commends Hull and Horne for WEP Construction

CONNELLSVILLE, Pa.—High tribute to the construction record of Burt Hull, vice president and general manager of the War Emergency Pipelines, Inc., and to Maj. A. N. Horne, vice president, was paid here last week by W. Alton Jones, president, on an inspection trip of the WEP eastern extension which is nearing completion.

"We are coming down the last lap," declared Mr. Jones who added that the construction record is a saga of success despite floods and unprecedented rainfall following a winter of unusual severity for this type of work.

Reconditioning Work Started on Texas Line

HOUSTON, Tex.—Work is under way covering the reconditioning of 10 miles of the Southwest Emergency Pipe Line Co.'s line extending from the Corpus Christi, Tex., area to connections serving refineries near Houston. The reconditioning work on this former natural-gas line acquired by the Defense Plant Corp. early in the year, includes a section 5 miles east of the Bloomington station and a second section 5 miles west of the Pierce Junction station. The O. C. Whitaker Co. and Williams Brothers Corp. are doing the work which was recently authorized by the War Production Board.

The reconditioning includes taking up the coupled line and repairing leaks with the replacement of short lengths of pipe if necessary. It is understood that this work has been authorized to determine whether it is feasible to recondition the entire line which consists of 58 miles of 14-in. and 92 miles of 16-in. The line when recently tested after being converted from natural gas to crude-oil service had so many leaks that its operation was not practical until the reconditioning work was completed. It is understood that those in charge of the line estimate that it will require 3 to 4 months to recondition the entire line involving an expenditure of $2,000,000.

The line was acquired by DPC in January from the United Gas Pipe Line Co. and the Humble Pipe Line Co. was appointed agent to supervise a program of using the line in crude-oil service. The line extends from Refugio to Pierce Junction. Other lines in the Corpus Christi area have been connected to the line which, it is estimated, will have a capacity of 75,000 bbl. daily of crude oil and products when completed. In the Houston area, lines serving refineries are connected to the system. It is understood that the five pump stations on the line are 95 per cent completed.

The delays in completing the entire system owing to the difficulties with the former natural-gas line are an important factor in the planned movement of crude oil and products from Southwest Texas fields and refineries to the Houston area. To carry out the program of petroleum planned for the summer months it may be necessary to use tankers from Corpus Christi to Houston.

Central Granted Permit For Quitman Field Line

QUITMAN, Tex.—A new pipe-line outlet for the Quitman pool in northern Wood County, Texas, has been authorized by the War Production Board, according to information received here last week.

Central Pipe Line Co., of Hawkins, Tex., received the authorization to build 35 miles of 4 and 6-in. line from its pump station at Big Sandy.

The Central company recently purchased the 60-mile 8-in. pipe line and gathering system of Rogers Lacy, running from the Hawkins pool to Gladewater, Tex. It is planned to run the Quitman high-gravity oil to Big Sandy where it will connect with the Hawkins line and then be carried to Central East Texas.

Sinclair Completes Line to Washington, D. C.

WASHINGTON, D. C.—The Washington artery of Sinclair Refining Co. (Union) products system is now in operation, temporarily receiving traffic from the company's Marcus Hook, Pa., refinery.

The Washington and Baltimore artery is part of the pipe line that will eventually receive deliveries from the Steubenville, Ohio, terminal on the Ohio River after barges make delivery at that point from Middle West and Southwest refineries. When the

Steubenville connection is completed, flow through the Sinclair line will be reversed, moving from West to East and contribute even more substantially to relief of the East Coast shortage.

First work on the Sinclair Refining eastern products system started in October 1941, originally extending to Greensburg, Pa., as a facility for distributing gasoline and light fuel oil from the company's refinery at various points along the route in southern Pennsylvania. The pipe line, with a capacity of 12,000 bbl. per day, eventually became a part of PAW Project 4. The company's original program of building an 8-in. line from Wood River, Ill., to Steubenville for continuous pipe-line delivery to the eastern terminals at Marcus Hook, Pa., Baltimore, Md., and Washington, D. C., were rejected in favor of supplies transported by barges up the Mississippi and Ohio rivers.

The Baltimore-Washington artery ties into the main line at Mechanicsville, Pa., and is equipped to make deliveries at 19 other bulk stations along the right-of-way.

Oil Barge Program Will Be Completed Late This Year

WASHINGTON, D. C. — A check last week revealed the following status of the construction of government barges to carry oil from Texas Gulf ports to eastern terminals via inland and intracoastal waterways.

By the latter part of 1943, a total of 473 barges, 100 tugboats, and 21 river towboats will be in operation according to present schedule.

The barges will use two routes: one through the Gulf Intracoastal Waterway from Texas to Panama City, Fla., from where the oil will be shipped across Florida by tank car to Jacksonville, and thence by barge along the Atlantic Intracoastal Waterway to eastern oil-distribution ports. The other route is up the Mississippi River by barge tow for transshipment by rail.

The barges are of three types—all wood, all steel, and a composite of wood with fabricated steel supporting trusses. The wooden and composite barges have a capacity of 6,000 bbl. and are 169½ ft. long, with a 34-ft. beam, and a 10-ft., 6-in. depth. The all-steel barges have a capacity of approximately 9,500 bbl., are 195 ft. long, with a 35-ft. beam, and a 9-ft., 9-in. depth. The tugs are steel hulled, equipped with 600-hp. diesel engines, are 85 ft., 10½ in. long, and have a beam of 24 ft. and a depth of 10 ft., 6 in. The river towboats, also steel hulled, are propelled by steam 2,000-hp. engines, and are 185 ft. long, with a 54-ft. beam and an 11-ft. depth.

Sponsored by the Office of Defense Transportation and approved by the War Production Board, the program is financed by the Defense Plant Corp., and carried out with the cooperation of the Petroleum Administration for War and other government agencies.

The design and construction of the barge, tug, and towboat fleet is under the supervision of the United States district engineer of the War Department at Philadelphia, Pa., and all work has been placed under contract through that office. Terminal facilities under construction at Jacksonville and Panama City, Fla., are under the supervision of the United States district engineer at Jacksonville.

The barge channels to be travelled have been completed and are being maintained by the Corps of Engineers, Army Service Forces. The Gulf Intracoastal Canal was completed to present specifications between Corpus Christi, Tex., and Panama City, last year.

Deliveries Through Eight Eastern Lines Decline

NEW YORK.—Deliveries of crude oil through pipe lines in the eastern area of the United States for the first 5 months of this year showed a slight reduction against the similar period in 1942. This marks the first downtrend, on a cumulative monthly basis, in these deliveries for a long period.

For the eight lines in the eastern group such deliveries aggregated 135,503,000 bbl., compared with 135,739,000 bbl. in the initial 5 months of 1942. Declining production of crude oil in Illinois is partly responsible for smaller deliveries this year. Reductions were reported by Buckeye Pipe Line Co. and Ohio Oil Co.

For May, the eight lines reported deliveries of 29,312,000 bbl., against 27,000,000 in April and 30,282,000 for May 1942.

In the accompanying tabulation are shown deliveries of crude by the eight lines for May and for the first 5 months with comparisons for similar periods in 1942, in thousands of barrels:

	May	
	1943	1942
Buckeye	12,488	14,236
Eureka	1,231	933
National Transit	1,938	1,762
N. Y. Transit	1,109	1,168
Northern	1,783	1,549
Ohio Oil	8,440	8,547
Southern	952	816
Southwest Penna.	1,371	1,271
Total	29,312	30,282
Daily average	945	977

	5 months	
	1943	1942
Buckeye	53,312	60,227
Eureka	5,186	4,683
National Transit	9,070	8,388
N. Y. Transit	5,449	5,224
Northern	8,490	7,130
Ohio Oil	40,118	40,265
Southern	4,321	3,727
S. W. Penna.	6,637	6,095
Total	135,583	135,739
Daily average	898	899

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Week's Highlights

AS the first half of 1943 draws to a close, an inventory of discoveries indicates that the downward trend of the past 4½ years may have been reversed. Discoveries have been made during the first half of this year which may eventually add more oil than has been produced during this period. At first glance, this suggests a repetition of past history when, after a period of dwindling supplies, discoveries came in thick and fast and a famine was rapidly converted into a feast.

Analysis of some of the details of both past and recent history, however, modifies this optimistic view to a considerable extent. Among the fields which converted the shortage of the early 20's into the flood of the early 30's were Oklahoma City, the Texas Panhandle, East Texas, and the Seminole and West Texas areas. These five areas combined account for about 14,000,000,000 bbl. of oil or over 25 per cent of the national total. They were all almost universally condemned as prospective producing areas, with the exception of East Texas. A Woodbine field could have been anticipated somewhere in this area on general principles. However, on the whole, it may be said that the discoveries which maintained American oil supremacy between the end of World War I and the present time were in areas where the presence of large quantities of oil was unsuspected.

Moreover, and this is a highly important fact, in each case, important discoveries were made by the first well or one of the first wells to be drilled in the new area.

Turning to this year's record, the important discoveries are in the Ellenburger of West Texas and the Lower Cretaceous of East Texas. Neither of these developments can be considered surprising. The Winkler County Ellenburger discoveries may be better than was anticipated but after Big Lake, Sand Hills, Barnhart, Abell and Apco, to say nothing of the distant K.M.A. field, it can hardly be considered surprising that Ellenburger production would also be found on other Permian basin structures. In the East Texas basin, Rodessa, Talco and Sulphur Bluff established large Lower Cretaceous production in the district. Recent discoveries may be better than was anticipated and the oil may be of higher grade but the fact that oil would be found in the Lower Cretaceous of the East Texas basin has been established for years.

Meanwhile, where are the new provinces analogous to those found in the 20's? Many holes have been drilled in every one of the prospective new areas without finding even a good show. With every additional dry hole, the chances of opening up a new prolific oil province become more remote.

A further point which reflects on the precarious position in which the American oil industry finds itself at the present time is that accompanying the flood of discoveries in the 20's there was the development of a new and highly successful method of prospecting, geophysics. Today geologists and geophysicists agree that there is no other new and revolutionary prospecting method in sight and that the geophysical methods have seen their greatest successes.

WEST TEXAS: Further tests of the Winkler County Ellenburger discoveries show increased production, the Carter discovery having the best potential of any Ellenburger well in the basin outside of Big Lake (p. 162).

LOUISIANA GULF COAST: The world's deepest producer is being completed at De Large (p. 167).

TEXAS GULF COAST: A new field is in prospect northeast of Van Vleck, Matagorda County (p. 181).

COMPLETIONS IN ALL FIELDS . . .

(Week ended June 19, 1943)

	Oil	Gas	Dry	Total	Footage	Total comp. to date 1943	1942
N. Y., Penn., W. Va.	48	12	3	63	124,556	1,496	1,634
Ohio	4	6	5	15	31,033	379	459
Indiana	2	0	2	4	5,279	112	151
Kentucky	3	5	3	11	25,610	152	103
Illinois	14	0	10	24	63,327	768	722
Michigan	6	3	8	17	38,720	216	310
Kansas	13	0	9	22	77,111	693	683
Nebraska	0	0	0	0	0	12	20
Missouri-Iowa	0	0	0	0	0	7	9
Oklahoma	15	2	13	30	102,007	508	602
Texas:							
North Central Texas	7	0	17	24	57,701	561	563
West Texas	6	1	3	10	52,108	375	778
Texas Panhandle	6	1	0	7	21,658	83	199
Eastern Texas	3	0	5	8	44,791	127	190
Texas Gulf Coast	9	0	5	14	96,352	189	387
Southwest Texas	2	0	13	15	62,314	398	611
Total Texas	33	2	43	78	334,924	1,733	2,728
North Louisiana	2	2	4	8	32,293	138	222
Louisiana Gulf Coast	3	2	3	8	70,450	162	251
Total Louisiana	5	4	7	16	102,743	300	473
Arkansas	4	0	2	6	24,536	110	71
Mississippi and Southeast	3	0	3	6	29,199	42	26
Montana	1	0	2	3	5,608	83	75
Wyoming	1	0	1	2	9,387	52	42
Colorado, Utah	1	0	0	1	595	6	5
New Mexico	1	0	1	2	6,705	97	115
California	22	1	5	28	97,787	576	370
Total United States	176	35	117	328	1,070,137	7,342	8,598
Total previous week	175	33	119	327			
Week ended June 20, 1942	183	37	102	322			

THE DERIVATION OF RESERVOIR ROCKS

by W. V. Howard

PART I

The materials which form reservoir rocks are derived from the disintegration and decomposition of older rocks. Each rock exposed to erosion provides material which is transported seaward which may form new sediments or may alter the composition, porosity and permeability of those already deposited. The leached material remaining may also form reservoirs. In this installment, reservoirs derived from sandstones of the quartzitic type are discussed. The relationships of other rock classes will be taken up in subsequent articles in the series.

IN previous articles in this series it was pointed out that many of the details of the deposition and lithification of sediments were still unknown. Although for complete understanding of the role of sedimentation and the characteristics of sedimentary rocks, more information on these subjects is desirable, there are so many later changes in sediments that modify their original characteristics that too much detailed study of the original processes and the first of the secondary modifications may prove unnecessary, particularly for correlating geological facts with reservoir engineering.

Probably one of the most difficult facts to realize in dealing with oil reservoirs is that the reservoir rock may play a negative role in the system. That is, a reservoir rock is merely something with holes in it which holes can contain oil and, under proper conditions, can give it up to other holes, or wells. The chemical composition of the reservoir, therefore, becomes important only in so far as the materials of which it is composed lend themselves to the preservation or development of porosity and permeability.

Residual Reservoirs

Another point which is often implied is that a reservoir rock is something which was deposited as such in the sea. Oil has been found in weathered granite which was never deposited in the sea. The Madison limestone of Montana, Wyoming and Alberta contains oil but this formation is overlain directly by deposits which were laid down in the Jurassic, possibly 100,000,000 years later. It is difficult to conceive of oil forming in the Madison, staying there for that length of time and then rising into the reservoir only after a seal was laid down over it. In both of these instances the sequence is much more logically: (1) formation of rock which later became the reservoir, (2) exposure to erosion, (3) development of porosity, (4) burial beneath the sea, (5) entrance of oil-forming material and deposition of sealing formation.

There is not much oil in weathered granite; nor is the Madison limestone of major importance, but it will be shown later that this sequence was probably followed in reservoirs responsible for more than half of the world's production of oil.

Tracing these processes backward, steps 5, 4 and 2 deal with movements of the crust which are independent of the type of rocks involved. Step 3 is definitely dependent upon the nature of the rock. It is, therefore, necessary to consider this in more detail.

Fig. 1-I shows a full cycle of uplift and of sedimentation involving major crustal movements and uplift of the land mass to such a point that the igneous rocks, formerly buried deep in the crust, are exposed to erosion. It therefore involves all of the characteristics of each of the other cycles which represent movements of lesser magnitude. None of these cycles are continuous from the start through the culminating point and back to the start. They are generally oscillatory with frequent reversals of movement giving rise to unconformities in the sediments deposited in the sea.

Sediments of the normal type may thus be derived from the normal (quartzose) type or the greywacke or arkose types at different points in the cycle. They may also be interbedded in sections predominantly of the greywacke or arkose classes. They start and conclude each complete cy-

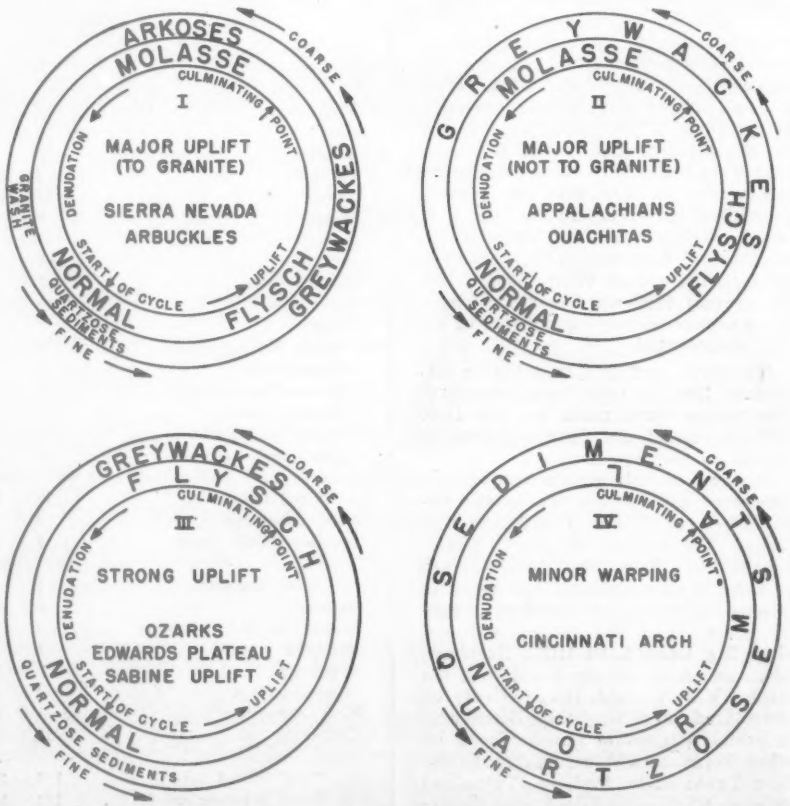

Fig. 1—Diagrammatic representation of cycles of sedimentation based upon the magnitude of the uplift in the adjoining land mass

cle. They therefore contain material derived from weathered igneous rocks, particularly at the close of a cycle, but since both intrusives and volcanic rocks may occur anywhere, the products of the disintegration and decomposition of these rocks may also be present throughout a series of the normal type. Thus, all of the processes which lead to the formation of oil reservoirs are involved in the areas which yield sediments of the normal type and in the areas in which they are deposited. These processes are, however, modified in deposits of the flysch and molasse type.

Processes on Land Surfaces Contributing Material for Normal Sediments

In outlining the processes which result eventually in the formation of normal sediments, each rock type may be considered separately. Much of the product of decomposition of rocks goes into solution in the sea and remains there as the sea is far from saturated with respect to certain constituents. In other cases, minor constituents are deposited in the sea as a result of chemical processes which may be little understood.

Sandstones and conglomerates: The coarse-grained clastics on flat or gently sloping land surfaces are attacked by both physical and chemical agents which disintegrate and decompose them. The pebbles in conglomerates may be of any type of rock and are thus subject to the same reactions as affect the rocks of which they are composed. In the case of both rocks, the outstanding effect of erosion is to separate the grains from the cementing material. Thus, the principal effect of erosion of a sandstone is the formation of a sand or gravel. The cementing material, which is usually calcareous, argillaceous or ferruginous is dissolved, or in the case of the two cements last named, partially dissolved and partially converted into other minerals. Part of the argillaceous cement forms clay minerals and part of the ferruginous cement forms iron oxides.

As a result of the breaking down of a sandstone or conglomerate by removal of its cement, reservoirs of four types may be formed.

1. The sea may advance over the partially eroded sandstone or conglomerate before disintegration is

DAILY AVERAGE PRODUCTION FOR WEEK

	June 19 crude oil	June PAW quota all oils	June 12 crude oil
Arkansas	75,750	72,800	73,785
California	780,300	823,300	772,500
Colorado	6,800	7,000	5,830
Eastern fields	101,100	111,500	100,450
Illinois	226,900	246,200	212,850
Indiana	14,100	15,500	11,400
Kansas	202,200	300,000	305,700
Louisiana	326,650	330,800	326,695
North Louisiana	*85,800*	.....	*85,845*
Louisiana Gulf Coast	*240,850*	.....	*240,850*
Michigan	54,390	58,900	61,010
Mississippi	53,400	50,000	52,700
Montana	20,915	22,300	18,120
Nebraska	2,100	2,400	2,150
New Mexico	98,600	105,700	101,300
Oklahoma	334,100	373,500	334,650
Texas	1,496,800	1,602,000	1,495,800
East Texas	*334,900*	.....	*334,900*
West Texas	*228,950*	.....	*228,950*
North Central Texas	*131,800*	.....	*131,800*
East Central Texas	*123,500*	.....	*123,500*
Texas Panhandle	*90,100*	.....	*90,100*
Texas Gulf Coast	*514,550*	.....	*531,700*
Southwest Texas	*73,000*	.....	*72,850*
Wyoming	96,500	97,000	96,280
Total United States	3,990,605	4,218,900	3,971,220

Total production Jan. 1-June 19, 1943 ..... 665,469,405 bbl.
Same period last year ..... 646,531,105 bbl.

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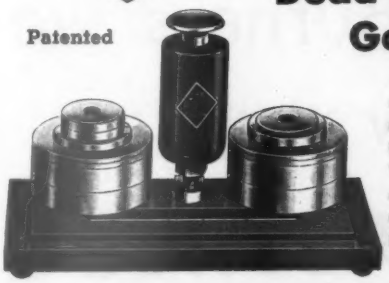

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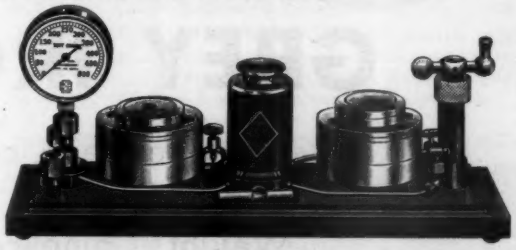

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complete. It will dislodge and remove the loose material at the old land surface but may not affect the consolidated and partially consolidated material below. This may have been tightly cemented originally, but the action of weathering will have tended to remove some of the cementing material, thus increasing the porosity. Regardless of the structural conditions present locally, this type of reservoir can be considered a stratigraphic trap. It is characterized by widespread permeability and by a pinchout updip whether or not this dip was toward or away from the shore line. These reservoirs form many of the largest fields and may be classed as **truncated sands beneath an unconformity.** Of the many examples of these fields, East Texas and the Wilcox and lower Simpson pays of Oklahoma City may be cited.

2. Much of the sand and gravel formed by disintegration of a sandstone or conglomerate is carried by water and wind flowing over the surface of the land and is deposited in rivers and lakes. These deposits are, thus, under water or are in valleys near the water table. When the sea advances over the sand, it will not remove the sand already under water and will tend to level off sand bars and beach deposits along the margins of the bodies of water. The sand in rivers is thus buried and forms a potential reservoir. In the case of lakes, most of the deposits are muds, although there are sand beaches around the shores. These may form reservoirs, although none are known at the present time. **Buried river beds** occasionally form reservoirs of the shoestring type, as in the Pennsylvanian of southeastern Ohio. They are characterized by their long narrow shape with numerous branches, practically all of which form acute angles with the main channel, apexing downstream. Their permeability is generally irregular as the deposits were not laid down regularly in the first place and since there has not been enough reworking by the sea to redeposit them in uniform beds.

3. As the sea advances over the old land surface it tends to pick up the unconsolidated mantle rock and redistribute it over the slowly advancing continental shelf. The effect of this redistribution may be to form a number of lensing beds of sand which overlap one another shoreward, as in the case of many fields along the shallow Eocene trend in South Texas. If there are no periods of deposition of fine sediments, the sand may be connected across the bedding planes, so that if there is any oil accumulation it tends to work upstructure into the uppermost sand. As these sands are deposited by an advancing sea, they tend to lie on old land surfaces; that is, they are separated from the underlying formations by an unconformity, as in the case of the Misener sand of the Mid-Continent or the Hoing sand of Illinois. They differ from deposits of the same type in the flysch zones in that accumulations are generally not found in more than one sand on the same part of a structure. Frequently the sea piles up thick bodies of sand at some distance from the shore line resulting in shoestring sands of the Greenwood County, Kansas, type or even larger offshore sand bodies such as the large reservoir found at Burbank. This group of reservoirs may, therefore, be divided into two subtypes; **near-shore sand bodies** and **buried sand bars.** In both cases, deposition is fairly regular, but there are often impermeable streaks which may have no predictable relation to the outlines or surface of the sand body.

4. Much of the sand deposited following disintegration of an exposed sandstone or conglomerate is of the **blanket-sand type.** There is considerable argument over the way in which this sand is deposited. According to most geologists the sand is transported to the sea by wind or water and is deposited there. According to others, it is not deposited in the sea but is reworked by the sea when it advances over the land and all of the fine ma-

(Continued on Page 186)

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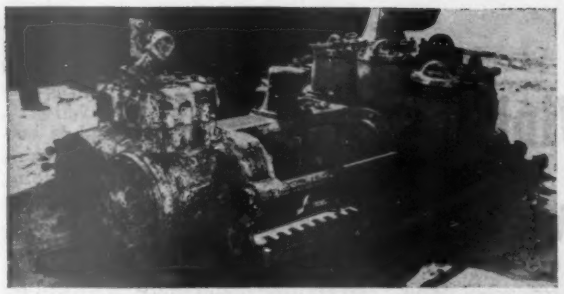

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PERMIAN BASIN, PANHANDLE

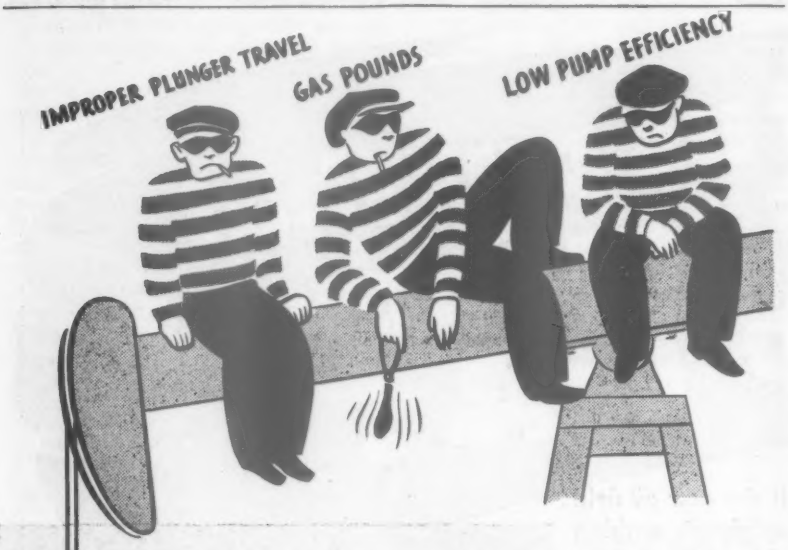
Good Flows Recorded in Winkler County Ellenburger Discoveries

MIDLAND, Tex.—Stanolind Oil & Gas Co. and Shell Oil Co., Inc., 1 W. D. Blue, third Ellenburger discovery for Winkler County this year, was flowing an estimated 35 bbl. fluid per hour through perforations from 10,647-97 ft. Half of the fluid was oil, and the balance was wash water and basic sediment. After being shut in for 12 hours, tubing pressure was 1,600 lb. and casing pressure was 800 lb. With elevation of 3,098 ft., the discovery topped Simpson at 9,510 ft., Ellenburger at 10,493 ft., and is bottomed at 10,697 ft. Seven-inch casing is set at 10,691 ft., and 2-in. tubing is run to 10,690 ft. The hole was washed for 3 hours with fresh water, then circulation was reversed and washed for 2 hours more, swab was run six times, and the well kicked off and flowed 3 hours before being shut in.

Official Railroad Commission potential test on Amon G. Carter C-2 Walton, first of the three Ellenburger discoveries in the county, showed 1,697.4 bbl. in 6 hours through 1-in. choke on casing and ¾-in. choke on 2-in. tubing set on bottom, or at the rate of 6,790 bbl. per day. This ranks it as one of the largest potential wells in the Permian basin.

Andrews County.—Humble Oil & Refining 1 Crews & Mast, SW SE Section 8, Block A-34, Public School Land, 3½ miles west of Means pool, indicated a new Permian pool when it showed 765 ft. oil and gas-cut mud on drill-stem test open 33 minutes from 4,600-74 ft. Core from 4,684-94 ft. recovered 10 ft. broken dolomite with some porosity, with bottom foot showing good porosity with both oil and gas. It cored ahead, and last core from 4,744-62 ft. recovered 18 ft. of lime with slight showing of oil and gas, and was shut down at 4,762 ft. to repair core barrel before coring ahead. The test is projected to 8,500 ft. East of the Emma pool, Skelly Oil 1-K University, SW SW Section 28, Block 9, University Survey, bottomed at 7,500 ft., plugged back to 5,550 ft., set 5½-in. casing at 5,466 ft., and is preparing to acidize the Holt zone pay encountered while drilling. Union Oil Co. 1 J. D. Biles, Section 19, Block A-31, Public School Land, Clear Fork test 4 miles northwest of Fullerton pool, was maintaining favorable structural position in topping Yates at 2,820 ft., brown lime at 3,830 ft., and solid lime at 4,070 ft., with surface elevation 3,381 ft.

Wildcat starts.—Four widely scattered areas of the basin were given deep wildcat starts last week. In Irion County, Humble Oil & Refining announced plans to drill another 9,000-ft. test on the Sawyer Cattle Co. ranch, located in Section 3, D. G. Coulson Survey, 15 miles east of the recent failure in Section 13, Block 1, T.&P.R.R. Survey, Reagan County. In Hockley County, Woodley Petroleum Co. 1 J. H. Howard is a new 6,200-ft. wildcat located in NE NE Section 65, Block A, R. M. Thompson Survey. In Mitchell County, Anderson-Prichard Oil Corp. 1 H. C. Miller is a 9,000-ft. wildcat in the Westbrook pool, NE NW Section 28, Township 1n, T.&P. R.R. Survey. In Parmer County, Stan-



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olind Oil & Gas 1 A. J. Jarrell, 1,965 ft. from west, 660 ft. from north, Section 19, Block B, Capitol Lands Survey, 4 miles northwest of Bovina, is an 8,000-ft. test.

Shallow tests announced last week include Pure Oil Co. 1 Sugg, 1,980 ft. from west, 660 ft. from north, Section 1942, A. H. Althofer Survey, Irion County, scheduled to go 3,500 ft. Henry Schooler et al 1 Allison, SW SE Section 5, Block 2, C.C.S.D.& R.G.N.G.R.R. Survey, Terrell County, is also a 3,500-ft. wildcat project, 9 miles south of Sheffield.

WEST TEXAS COMPLETIONS

Wildcats

Gaines County: Gulf 1 P. H. Kottwitz et al, NW NW Sec. 92, Blk. G, W.T.R.R. Sur., elev. 3,291 ft., dry, T.D. 6,070 ft.

Winkler County: Amon G. Carter C-2 Walton-Pure, SW NE Sec. 1, Blk. B-3, Public School Land, elev. 2,955 ft., San Andres 3,515 ft., Clear Fork 4,626 ft., Silurian 7,438 ft., Montoya 7,775 ft., Simpson 8,185 ft., Simpson sand 8,980 ft., flow 6,790 bbl., Ellenburger 9,215 ft., oil pay 9,495 ft., T.D. 9,655 ft. Discovery.

Yoakum County: A. H. and C. L. Rowan 1 S. J. Dixon, NE NW Sec. 571, Blk. D, J. H. Gibson Sur., elev. 3,658 ft., brown lime 4,290 ft., solid lime 4,760 ft., S.S.O. 5,390-5,400 ft., dry, T.D. 5,656 ft.

Fields

Fullerton, Andrews County: Texas Pacific Coal & Oil 3 Emily Jackson, NW SW Sec. 17, Blk. A-32, Public School Land, elev. 3,351 ft., flow 1,668 bbl., pay lime 6,740 ft., acid., T.D. 7,221 ft.

Fullerton Oil 6-A H. M. Wilson, NW NW Sec. 16, Blk. A-32, Public School Land, Yates sand 2,870 ft., I.P. 2,630,000 cu. ft. gas, pay 3,092 ft., T.D. 3,126 ft.

Funk, Tom Green County: W. H. Snowden 2 Funk, SE NE Sec. 32, Blk. 5, H.&T.C. R.R. Sur., elev. 2,438 ft., Blaine lime 1,155 ft., S.S.O. 1,105-10 ft., dry, T.D. 1,175 ft.

Mascho, Andrews County: Belfort Oil 2-F University, NE NE Sec. 10, Blk. 10, University Sur., elev. 3,221 ft., flow 160 bbl., lime pay 4,290 ft., shot 780 qt., T.D. 4,611 ft.

Sand Hills, Crane County: Lario Oil & Gas 1 J. B. Tubb-Humble, 2,306 ft. from N, 550 ft. from E, Sec. 5, Blk. 32, Public School Land, flow 1,103 bbl., pay lime 4,244 ft., acid 3,000 gal., T.D. 4,633 ft.

Slaughter, Hockley County: Texas 139 Bob Slaughter, 551 ft. from N, 660 ft. from W, Lab. 60, Lge. 39, Maverick County School Land, elev. 3,577 ft., flow 1,176 bbl., pay lime 4,920 ft., acid 14,000 gal., T.D. 5,005 ft.

Wasson, Gaines County: Continental 4-53 A. L. Wasson, 2,086 ft. from S and W, Sec. 53, Blk. AX, Public School Land, elev. 3,568 ft., flow 375 bbl., lime pay 4,925 ft., T.D. 4,956 ft.

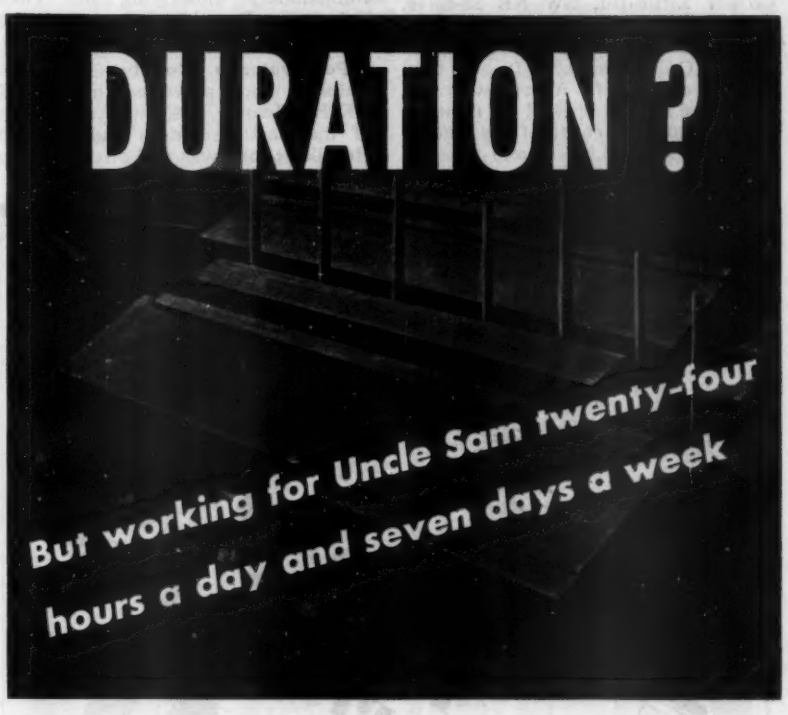
TEXAS PANHANDLE

AMARILLO, Tex.—Panhandle operators were cheered last week with the announcement that Panhandle crude prices would be raised 7 cents a barrel, which eliminated price discrimination against the Panhandle.

New wildcat for the Panhandle is L. H. Puckett 1 Seely estate, SW SW Section 413, Block I-T, H.&T.C.R.R. Survey, 8 miles south of Coldwater, and 4 miles southeast of I.T.I.O. 1 Mollie Davis, which showed for a gas well. Stanolind 1 Corbin, Armstrong

(Continued on Page 184)

CLOSED FOR THE DURATION ?



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OKLAHOMA

Deep Sand Adds to Cumberland Reserves

INTEREST was revived in the Oil Creek sand zone of the Cumberland field last week when Pure Oil Co.'s 7 Little-101, SW NE 28-5s-7e, flowed more than 150 bbl. of oil an hour through tubing choke. Top of the Oil Creek was 5,628 ft. and total depth was 6,325 ft. A drill-stem test at 6,095-6,205 ft., opened 30 minutes, showed 7,000,000 cu. ft. of gas. Packer was then set at 6,293 ft. and the well flowed 93½ bbl. of oil in 30 minutes with a decrease in the amount of gas.

Presence of oil in the Oil Creek sand was reported as early as 1941 but production of the field, at present nearly 10,000 bbl. a day, made development unnecessary. The 7 Little-101 is the deepest producing well in the field and is in the third producing zone in the Simpson series. Immediately underlying the Viola lime is the Bromide, followed by the Tulip Creek, and the Oil Creek.

Pottawatomie County. — Charles Balph 1 Pool, a wildcat in the NE NE NE 6-9n-4e, 2½ miles northwest of the East Tecumseh and western Hotulke pools, was put on the pump after swabbing 300 bbl. of fluid containing 20 per cent oil. Perforations were in the Dense lime at 5,185-91 ft. Tops logged were the Hunton at 4,998 ft., which was dry; Viola 5,120 ft., Dense 5,175 ft., dolomite 5,200 ft. and the Wilcox at 5,224 ft. The well has been testing for several weeks and has been plugged back to 5,201 ft.

Logan County.—Six miles southeast of Guthrie, Anderson-Prichard Oil Corp. 1 Morgan, NW NE 33-16n-1w, was reported to be making from 25 to 30 bbl. of oil a day while drilling in Bartlesville sand at 5,287-5,313 ft. Seven-inch casing was set at 5,288 ft.

OKLAHOMA COMPLETIONS

Wildcats

Garvin County: Amerada Pet. 1 House, SE NW 2-1n-3w, dry, T.D. 10,996 ft., Hunton 9,510 ft., Viola 10,020 ft., Bromide 10,545 ft., sand 10,965 ft., drill-stem tests at 10,810 and 10,809 ft., recovered mud.

Hughes County: Deep Rock 1 Price, NE NE NE 29-7n-10e, flowed 572 bbl. in 24 hr., 14,500,000 cu. ft. gas, gravity 38.3, sand 3,872-82 ft.

Kiowa County: Texas Co. 1 Bradley, NE NW SE 6-7n-15w, dry, T.D. 3,327 ft., base Permian 2,377 ft., limestone 2,920 ft.

Lincoln County: Wilcox 1 Gully, SE SW 36-12n-5e, dry, T.D. 4,890 ft., Bartlesville 3,868 ft., Hunton 4,555 ft., Viola 4,750 ft., Wilcox 4,831 ft., second Wilcox 4,857 ft.

Okfuskee County: W. O. Carter 1 Bucco, NE NE SE 20-10n-12e, dry, T.D. 3,267 ft., gas sand 2,490-2,505 ft., 2,000,000 cu. ft. gas and hole full of water, Cromwell 3,195 ft.

Oklahoma County: Hall-Briscoe 1 Barry, NW NW SE 35-13n-1e, dry, T.D. 6,006 ft., Hunton 5,566 ft., Viola 5,713 ft., Wilcox 5,814 ft., second Wilcox 5,940 ft.

Oklahoma County: W. E. Hightower et al 1 Young, SE SE NE 11-14n-4w, dry, T.D. 6,885 ft., Oswego 5,970 ft., Bartlesville 6,230 ft., Hunton 6,285 ft., Viola 6,576 ft., second Wilcox 6,850 ft.

Pontotoc County: Argo Oil Corp. 1 Choate, SE NE NW 31-4n-6e, dry, T.D. 3,542 ft., Hunton 2,690 ft.

Pottawatomie County: Amerada Pet. 1 Alfred, SW NW NE 27-10n-4e, dry, T.D. 5,075 ft., Earlsboro 4,150 ft., Hunton 4,730 ft., Viola 4,856 ft., Wilcox 4,960 ft., second Wilcox 5,042 ft.

Seminole County: Senora Oil & Gas 1 Griffin trustee, SE SE 29-5n-6e, dry, T.D. 2,801 ft., Pennsylvanian Caney 1,910 ft., Mayes 2,320 ft., Hunton 2,581 ft.

Fields

Big Bend, Osage County: A. G. Oliphant No. 1, NW SE 20-25n-3e, flowed 1,168 bbl. in 24 hr., gravity 41, flowed 85 bbl. in 1 hr., Layton 2,846-67 ft.

Chickasha, Grady County: Sinclair Prairie 5-A Pooler, NW NE 22-5n-8w, 27,000,000 cu. ft. gas, sand 4,686-4,742 ft., T.D. 4,775 ft.

Dilworth, Kay County: Dave Morgan 2 Klink, NW SW NW 21-29n-1e, pumped 45 bbl., Mississippian chat 3,380-3,446 ft., T.D.

Earlsboro N., Pottawatomie County: J. E. Crosbie 1 Burke, NE SW SW 1-9n-4e, flowed 240 bbl. through ½-in. choke, Hunton 4,218-30 ft., T.D. 4,243 ft.

Ed Cox, Carter County: Jim Harrell 2 Cox, NW NE SW 22-2s-2w, dry, T.D. 1,418 ft.

Edmond N.E., Oklahoma County: Harper-Turner 1 Hamman, NE SW 8-14n-2w, flowed 31 bbl., Bartlesville 5,871-98 ft.

Isom Springs, Marshall County: Gill-Morse 1 Minter, NW NW SE 31-7s-6e, pumped 5 bbl., T.D. 515 ft.

Ellis-Winans 1-A Snell, NW SW SW 31-7s-6e, pumped 7 bbl., T.D. 515 ft.

Loco, Stephens County: Phillips Pet. 1 Baker, SW SW NW 36-2s-6w, flowed 7½ bbl., T.D. 1,841 ft.

Jackson Bros. 1-A Dilley-C, SE NE NE

(Continued on Page 187)

EASTERN TEXAS FIELDS

Tri-Cities Gas-Distillate Pool Is Extended

DALLAS, Tex.—Stanolind Oil & Gas Co. 1-B Tri Cities unit, located on the R. F. Holland fee, James Rice Survey, 6 miles southwest of Athens, extended the Tri-Cities gas-distillate pool when it was completed for a flow of 148 bbl. 65° distillate on 12/64-in. bottom-hole choke, ⅜-in. surface choke, with gas-oil ratio 12,960 to 1. Bottomed at total depth 8,500 ft., the well is producing through perforations from 7,665-7,770 ft. The same company's 1-D Tri-Cities unit, Wiley Kay Survey, bottomed at 8,673 ft., plugged back to 8,440 ft., where it will make a test of the Travis Peak, topped at 8,330 ft. The company has staked location for 3-C Tri-Cities unit, 1,113 ft. from north line and 330 ft. from west line of 98.57-acre track of C. W. Leopard, in Jose Y'Barbo Survey, 6 miles southwest of Athens.

Hunt County.—North offset to the new Paluxy sand discovery 1 mile northwest of Campbell has been staked by Stanolind Oil & Gas Co. as its 1 McCaston, 635 ft. from west line and 330 ft. from the north line of lease in C. C. Dale Survey. Humble 1 F. F. Graham, Smackover lime test in William Elam Survey, 1 mile northwest of Weiland Woodbine sand pool, was drilling below 8,718 ft. Ohio Oil Co. has staked a twin to the wildcat on which hole was lost last week at 2,888 ft. in 1 Langford, James Hamilton Survey, in southeast part of the county.

Wood County. — One mile east of their Woodbine sand potential discovery being carried to the Paluxy, Jackson & Fisher have staked location for 1 First National Bank of Quitman, 330 ft. from south and west lines of 185-acre tract, Jane Duncan Survey. It is to be a Woodbine test. At last report 1 McCarley, Hazard Anderson Survey, was drilling below 6,195 ft., expecting top of the Paluxy within the next 100 ft.

Kaufman County. — Sun Oil Co. 1 J. M. Rutledge, Smackover wildcat in the northeast part of the county, was drilling below 7,080 ft. in sand.

EAST TEXAS COMPLETIONS

Wildcats

Houston County: Cherry & Kidd 1 D. G. Moore, 330 ft. from N and E, J. Grissett Sur., elev. 335 ft., Pecan Gap chalk 5,852 ft., Austin chalk 6,755 ft., Eagleford 7,104 ft., Woodbine 7,202 ft., dry, T.D. 7,425 ft.

Smith County: B. F. Phillips 1 J. T. Browning, 1,433 ft. from N, 764 ft. from E of tract or 380 ft. from W, 1,433 ft. from N, Morgan Wilson Sur., dry, T.D. 2,193 ft.

B. F. Phillips 1 J. P. Collier, O.W.D.D., 660 ft. from N and W, 132-ac. tract., John Lovett Sur., elev. 503 ft., dry, old T.D. 2,800 ft., new T.D. 4,101 ft.

Wood County: B. B. Orr 1 J. C. Rainwater, 197 ft. from N and S, 276 ft. from E, 4.53-ac. tract, J. Sherman Sur., dry, T.D. 6,540 ft.

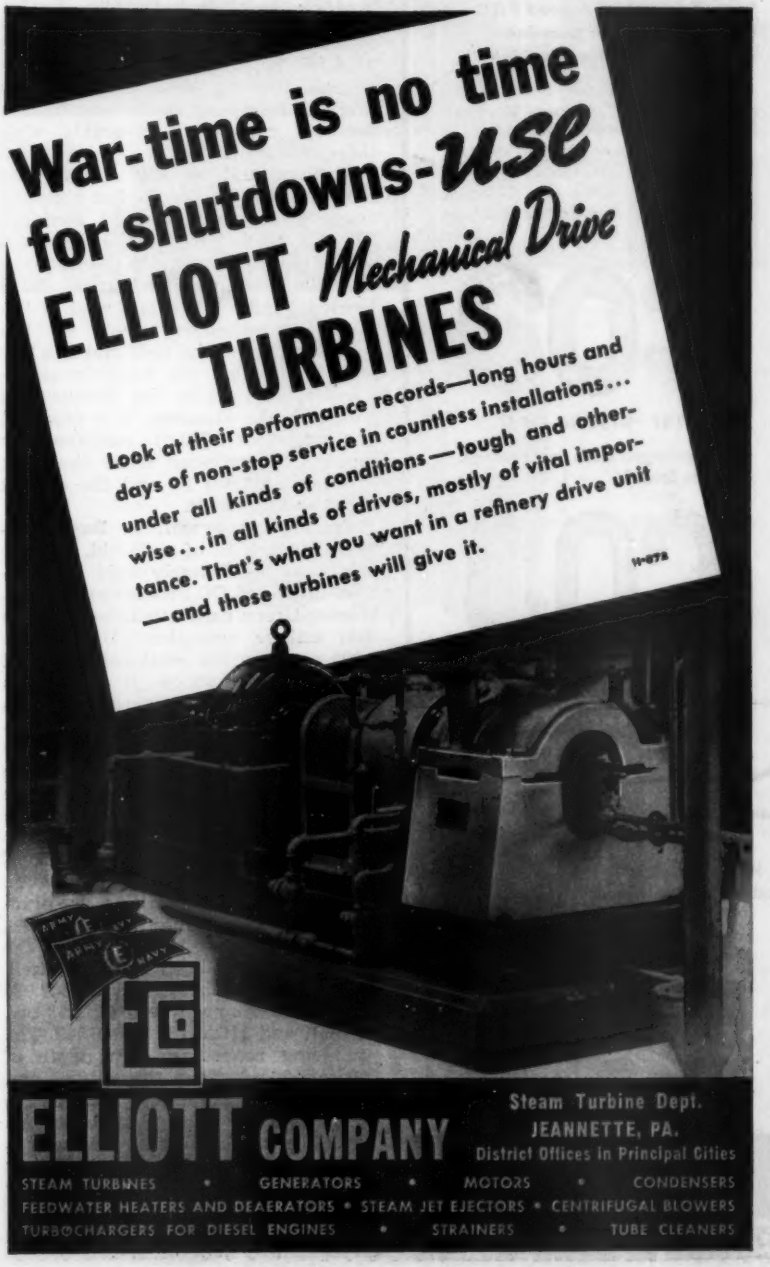
Sohio Prod. Co. 1 J. C. Morgan, 660 ft. from S and E, 82.5-ac. tract, Harvey Hall Sur., elev. 497 ft., Woodbine 4,624 ft., Paluxy sand, 6,513 ft., dry, T.D. 6,579 ft.

Fields

Chapel Hill, Smith County: Chapel Hill Gas and Sun Oil 1 C. C. Finch, 1,006 ft. from N, 660 ft. from E of tract, or 1,400 ft. from S, 660 ft. from E, Harvey Hall Sur., elev. 482 ft., I.P. 931 bbl. distillate, Paluxy sand pay 5,818-54 ft., T.D. 5,918 ft.

Quitman, Wood County: Bridewell, Lacy & Wise 1 Stone-Johnson, 467 ft. from S and W of tract, Hazard Anderson Sur., elev. 428 ft., flow 842 bbl., Paluxy sand pay 6,236-6,323 ft., T.D. 6,335 ft.

Tri-Cities, Henderson County: Stanolind 1-B Tri-Cities unit, 660 ft. from S and W, 78.5-ac. R. F. Holland tract, Jas. Rice Sur., elev. 436 ft., I.P. 148 bbl. distillate, 65.6 gravity ,pay 7,665-7,770 ft., P.B. to 7,714 ft. from T.D. 8,500 ft. Extension.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ROCKY MOUNTAIN

West Outpost to Elk Basin Makes Good Well.

DENVER, Colo.—Ohio Oil Co. 3 Mack OPC-7, ¾ mile west of the Tensleep sand discovery well in Elk Basin, which was reported a near completion last week flowing 308 bbl. in 13 hours through perforations in the 7-in. opposite the Tensleep, made 1,064 bbl. in 24 hours and is listed as a completion. It ran about 200 ft. lower than the discovery. The drilling well now being most closely watched is Yale Oil Corp. 1 Watson, ½ mile south and a little west of the Ohio 3 Mack. It was drilling at last report at 4,794 ft. in the red beds, and although running considerably lower than the discovery, the formations are reported correlating favorably with those nearer the top.

Madison test at Elk Basin.—The Stanolind Oil & Gas Co. has received approval for carrying its 1 Dengler, SW NE 35-9s-23e, on the Montana side of the field, down to the Madison lime for a test of that horizon. It is located 3 miles north and west of the Minnelusa discovery well in the southern part of the field and is a key well in defining the future possibilities of the field in the Tensleep as well as in the Madison. It is reported drilling below 4,743 ft., and the only tops so far released were the first Frontier at 1,910 ft. and the second Frontier at 2,223 ft.

Fracture zone well at Rangely.—The bringing in of a 25-bbl. well at 595 ft. in the Rangely field in Colorado in United Oil Production Co. 7-A Hunter-Green calls attention again to that unique operation. United has 1,200 acres on the southwest flank of the structure where it has been searching for the fractured zones in the Mancos shale in which the shallow production is found. In 1941 the California Oil Group, Ltd., opened an area 1½ miles to the southeast of the Raven Oil & Refining Co. production from the fractured zones, and the United area is to the southwest of this area and southeast of the Raven development. The drilling is practically all along the calcite seams, and development of this field in the past 3 years has been rather marked. The production in 1942 was 307,084 bbl., which compares with 221,258 bbl. in 1941, and 118,258 bbl. in 1940. The producing zones range in depth of 600 to 1,200 ft. from the surface and drilling is comparatively inexpensive as only surface casing has to be run. The effect of the United discovery is to prove further that the shallow production is not limited to one or two small areas, but may produce regardless of structure wherever fractured Mancos shale occurs.

Texas Co. scores at Kevin.—The Texas Co. exploration campaign around the outer limits of the Kevin-Sunburst field got off to a good start in its 1 Newman, NE SW SE 2-34n-3w, on the southwestern side of the field, immediately south of the town of Kevin, and in a district passed up in the early days as not very promising. It had the top of the Madison at 1,534 ft., and drilled to 1,538 ft., with a show of oil and a little water. After acidizing with 500 gal. and cleaned out it made 155 bbl. in 24 hours on the pump with no water. However, on the second period it showed 100 bbl. of water with 75 bbl. of oil.

Another Madison test at Frannie.—Continental Oil Co. has released location for its 6 Northern Pacific-Lease 1, NE SE SE 23-58n-98w, Frannie field, for a test to the Madison lime. It is ¼ mile northwest of Kirk Oil Co. 5 Government, a discovery in the north end of the field in the Madison last month, making 840 bbl. initial from the Madison at 3,181-3,271 ft. A number of years ago oil was found in the Madison in a test drilled by the old Midwest Refining Co. to the southeast of the Yale well, but the two are separated by a fault block. The Continental well will be the second drilled to the Madison to the north of the faults.

Bell sand test in Lance Creek.—Ohio Oil Co. 8 Converse Sheep, NW SE SW 32-36n-65w, a producer in the lower Leo sand, which is being deepened as a unit well to test the Bell sand and the Madison lime on top of the Lance Creek structure, had the top of the Bell sand at 5,482 ft., and showed streaks of saturation down to 5,517 ft., where a drill-stem test was made. Open 1 hour, it made 2 bbl. of oil. It then resumed coring and came out at 5,531 ft. with core showing somewhat better saturation than the upper part.

COLORADO COMPLETIONS

Rangely, Rio Blanco County: United Oil Production Co. 7-A Hunter-Green, NW SW 5-1n-102w, T.D. 595 ft., 25 bbl., from second zone of fractured shale.

WYOMING COMPLETIONS

Cole Creek, Natrona County: General Petroleum Corp. 57 Government, NW SW SE 22-35n-77w, T.D. 4,588 ft., dry in Shannon.

Elk Basin, Park County: Ohio Oil Co. 3 Mack-OPC-7, NE NW NW 31-58n-99w, T.D. 4,854 ft., top Tensleep 4,645 ft., initial production 1,064 bbl.

MONTANA COMPLETIONS

Kevin-Sunburst, Toole County: Texas Co. 1 Newman, NE SW SE 2-34n-3w, T.D. 1,538 ft., top Madison lime 1,534 ft., show of oil with little water, acid 155 bbl., oil and no water first 24 hr on pump, 75 bbl. oil and 100 bbl. water second 24 hours.

Hardrock Oil Co. 2-A Government, SW NW SW 11-35n-3w, T.D. 1,865 ft., Ellis-Madison 772-75 ft., dry.

Washington Oil Finding Co. 1 Government, NE SE SW 24-36n-3w, T.D. 2,410 ft., 1,800 ft. sulfur water, Ellis-Madison 2,110 ft., dry.

LOUISIANA GULF

Record Producing Depth Set By Well in De Large Field

NEW ORLEANS, La. — Oil interest in coastal Louisiana continued this week to center on developments at Union Producing Co. et al 1 Fitzpatrick-Vizard, in the De Large field, Terrebonne Parish, where preparations were being made for a final potential gage. Prospects of establishing a new world record for deep production looked favorable. On a drill-stem test from perforations at 13,475-90 ft., with $\frac{5}{8}$-in. choke at top and ¼-in. choke at bottom, the well began flowing the 3,000-ft. water cushion in 31 minutes. In 41 minutes the working pressure had built up to 2,100 lb. A ⅜-in. choke then was substituted at the top, and the pressure fell to 1,500 lb., and 120 ft. of condensate was recovered. Total depth of the Fitzpatrick-Vizard is 13,560 ft. The world's deepest producer is in the Da Large field. It is Fohs Oil Co.'s 1 Buckley-Bourg. Fohs is also interested in the Fitzpatrick-Vizard. Union Oil Co. of California has run conductor pipe at 1 Todd & Calvert, wildcat test in Terrebonne Parish, 1 mile north of Houma.

Evangeline Parish.—Danciger Oil & Refining Co. 1 Hattie Haas, Reddell area wildcat, was at total depth of 9,750 ft. An electrical survey to the bottom showed sand, possibly distillate, at 9,718-30 ft. Top of the Sparta was at 9,718 ft. Side-wall cores confirmed the electrical survey. As the week closed, operator was going in with core barrel to core ahead from 9,750 ft. It was expected to reach the top of the Haas sand at about 9,900 ft.

LOUISIANA GULF COAST COMPLETIONS

Wildcats

Vermilion Parish: Union Oil Co. of California 1-C Louisiana Furs, Inc., T-16s-2e, completed as gas well, without gage, shut in, T.D. 11,985 ft., discovery.

Fields

Bully Camp, Lafourche Parish: Texas Gulf Sulphur Co. 3 Delta Securities Co., Inc., 36-19s-21e, dry at 1,833 ft.

Eola, Avoyelles Parish: Amerada 1 Elizabeth S. Tubre, 45-1s-2e, O.W.W.O., old T.D. 8,570 ft., new P.B. T.D. 7,000 ft., 163 bbl. oil and 8 bbl. salt water through $\frac{7}{8}$-in. choke, T.P. 570 lb., gas-oil ratio 865, perf. 7,492-98 ft.

Grand Lake, Cameron Parish: Amerada 7 State-Mallard Bay, 12-13s-4w, O.W.W.O., old T.D. 9,000 ft., new P.B. T.D. 8,958 ft., 344 bbl. through ½-in. choke, T.P. 1,775 ft., gas-oil ratio 765, perf. 8,934-50 ft.

Lake Fausse, St. Martin Parish: Texas 13 State-Lake Fausse Point, Lake-11s-8e, 259 bbl. through 9/64-in. choke, T.P. 1,250 lb., gas-oil ratio 658, perf. 8,890-8,918 ft., T.D. 8,988 ft., P.B. 8,939 ft.

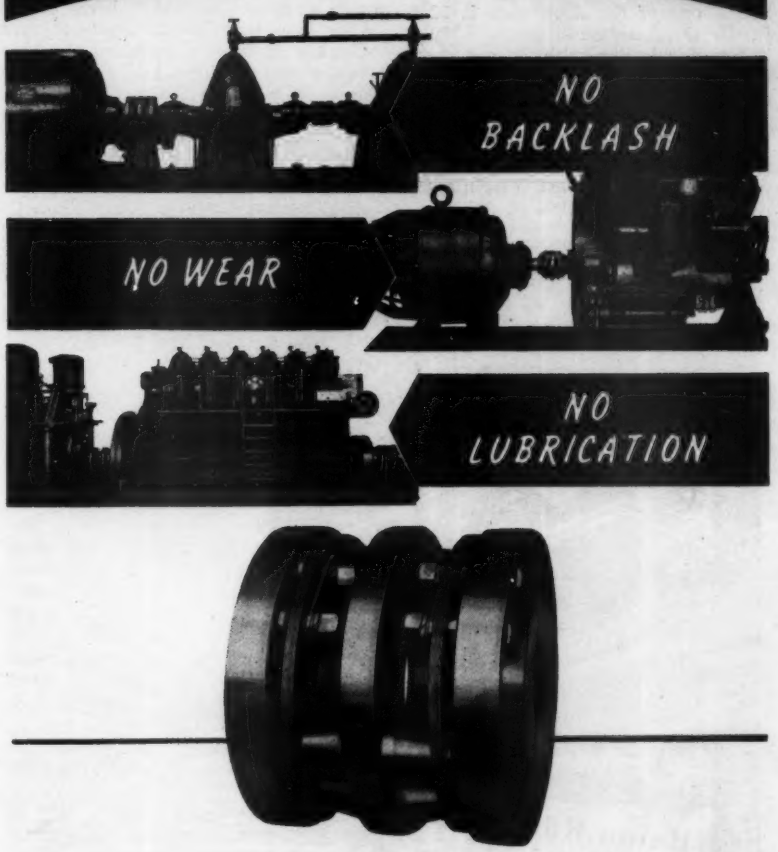
Leeville, Lafourche Parish: Texas 89 L.L.&E.-Leeville, 184 bbl. through ¼-in. choke, T.P. 960 lb., gas-oil ratio 634, perf. 9,998-10,010 ft., T.D. 10,114 ft. in sidetracked hole, P.B. 10,012 ft.

Little Bayou, Iberia Parish: William Helis 14 J. E. Schwing, 56-12s-7e, dry at 5,285 ft.

(Continued on Page 192)

NO LOST PRODUCTION TIME WITH

THOMAS FLEXIBLE COUPLINGS



Since there are no parts to wear out in Thomas Couplings, they last a lifetime. Furthermore, your machinery and prime movers will last longer, and require less maintenance while at the same time they give better service. Thomas Couplings provide these outstanding advantages since there is no stress, thrust, or cross pull on bearings when either parallel or angular misalignment, or both in combination are present. Serving all industries for 29 years there is no equal to Thomas Couplings for long, maintenance-free and continuous production service. Write for catalog today.

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THOMAS FLEXIBLE COUPLING CO.
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APPALACHIAN FIELDS

Chestnut Ridge Test Tops Oriskany With No Show

PITTSBURGH, Pa. — On Chestnut Ridge in Fayette County, Pennsylvania, one of the deep tests is 52 ft. in the Oriskany sand below 8,500 ft. but so far is dry with no gas showing even in the chert beds. Other deep tests drilling have not reached pay formations although on Laurel Ridge the Beck well reached 8,200 ft. and lost the tools with a cave on top. A deep southern West Virginia test was abandoned at 5,993 ft. as dry.

SOUTHWEST PENNSYLVANIA

Fayette County. — On Chestnut Ridge in South Union Township, Fayette County, New Penn Development Co., William E. Snee et al topped the Oriskany sand in 2 Inian Creek Coal Co. at 8,567 ft., and at 8,619 ft. there was still no showing of gas but also no water. There was no sign of any gas through the chert beds of the Onondaga lime. Here Peoples Natural Gas Co. completed redrilling the Marcellus in 1 Walters and are running a liner between the bottom of the casing and the Onondaga at 7,665 ft. In Wharton Township, Greensboro Gas Co. is drilling 4 Barton at 897 ft.

Beaver County. — In Ohio Township, Beaver County, South Penn Oil Co. is drilling at 1,624 ft. in the Oriskany test on the Cunningham-Vlatovich unit.

Westmoreland County.—In Ligonier Township, Westmoreland County, New Penn Development Co., William E. Snee et al lost the tools at 8,220 ft. in the deep test on the John and Eleanor Beck farm on Laurel Ridge and were unable to whip the line off. About 100 gal. of nitric acid were run in the hole and later about the same amount of water and its action freed the cable at bottom with the remaining cable appearing undamaged. In trying to whip the line off, considerable caving resulted and at present it is being cleaned out at 7,730 ft. In Derry Township, Peoples Natural Gas Co. is drilling at 4,730 ft. in the test on the Camilla Giffin farm.

SOUTHWEST PENNSYLVANIA COMPLETIONS

Armstrong County, Plum Creek Township: John C. Heckman 2 fee, 516,000 cu. ft. gas, Murraysville sand 1,230 ft., gas 1,270-79 ft., T.D. 1,279 ft.

South Bend Township: Wasson & Co. 1 E. E. Townsend, 963,000 cu. ft. gas after blowing open 12 hr., Thirty-foot sand 2,080 ft., about 80,000 cu. ft. gas at 2,080-84 ft., increase at 2,142-52 ft., T.D. 2,191 ft.

John Wray et al 1 Austin Say, 300,000 cu. ft. gas, Bradford sand gas 3,420-35 ft., T.D. 3,469 ft.

Greene County, Cumberland Township: Greensboro Gas Co. 1 John L. Lutes, 31,000 cu. ft. gas, Elizabeth sand 3,014-30 ft., gas 3,015-18 ft., T.D. 3,030 ft.

Washington County, Amwell Township: Carnegie Natural Gas Co. 1 Lozella Blaker, 671,000 cu. ft. gas, Murphy sand 751 ft., gas 817-22 ft., T.D. 822 ft.

Hopewell Township: Morris et al 3 J. D. Smith, dry through 2,320 ft., plugged.

WEST VIRGINIA

Kanawha County.—In Poca district, Kanawha County, Glenn Dearth shut down 2 Robert Wines at 1,630 ft. with the Big lime topped at 1,542 ft. and water at 1,622 ft. This is on the edge of the Big lime oil pool. His No. 1 is a fair oil well.

Tucker County. — The deep test of the Ohio Oil Co. on the Kaemmerling tract in Dry Fork district, Tucker County, is drilling in gray shale at 5,917 ft.

Wirt County. — In Tucker district, Wirt County, Columbian Carbon Co. has reached 2,060 ft. in the deep test on the Virgie Mason farm.

Wood County. — In Slate district, Wood County, the two Oriskany tests of the United Fuel Gas Co. 5263 F. R. Hart drilling at 860 ft. and 5264 J. A. Goudy at 715 ft.

WEST VIRGINIA COMPLETIONS

Boone County, Scott district: United Fuel Gas Co. 5207 Horse Creek C. & L. Co. 358,000 cu. ft. gas, Big lime 1,302 ft., Injun 1,503 ft., Berea 1,983 ft., brown shale 3,168 ft., gas from brown shale, T.D. 3,593 ft.

Braxton County, Birch district: Pittsburgh & West Virginia Gas Co. 7950 Gertrude B. Howell, 700,000 cu. ft. gas and 4 bbl. salt, sand 1,507 ft., T.D. 1,508 ft.

Kanawha County, Elk district: United Fuel Gas Co. 5222 fee, 103,000 cu. ft. gas before shot, Injun sand, T.D. 2,012 ft.

Putnam County, Curry district: R. E. Turley estate 1 T. E. Tincher, 310,000 cu. ft. gas, Berea, T.D. 2,160 ft.

Baton Rouge Makes First U. S. Rubber
BATON ROUGE, La., March 31. (INS)—The first crude rubber produced at the first synthetic rubber plant completed under government supervision since the Baruch committee made its report on the rubber situation was baled today.
The plant, located at Baton Rouge, and built coop

We'll be ready again with electric power service when it's needed for production of synthetic rubber at Port Neches and at Lake Charles.

By pulling together—making the most of our resources—your industry and ours save minutes. Every minute we save saves lives. And the saving of lives of American fighters by making Victory possible sooner is what we are all really fighting for right now.

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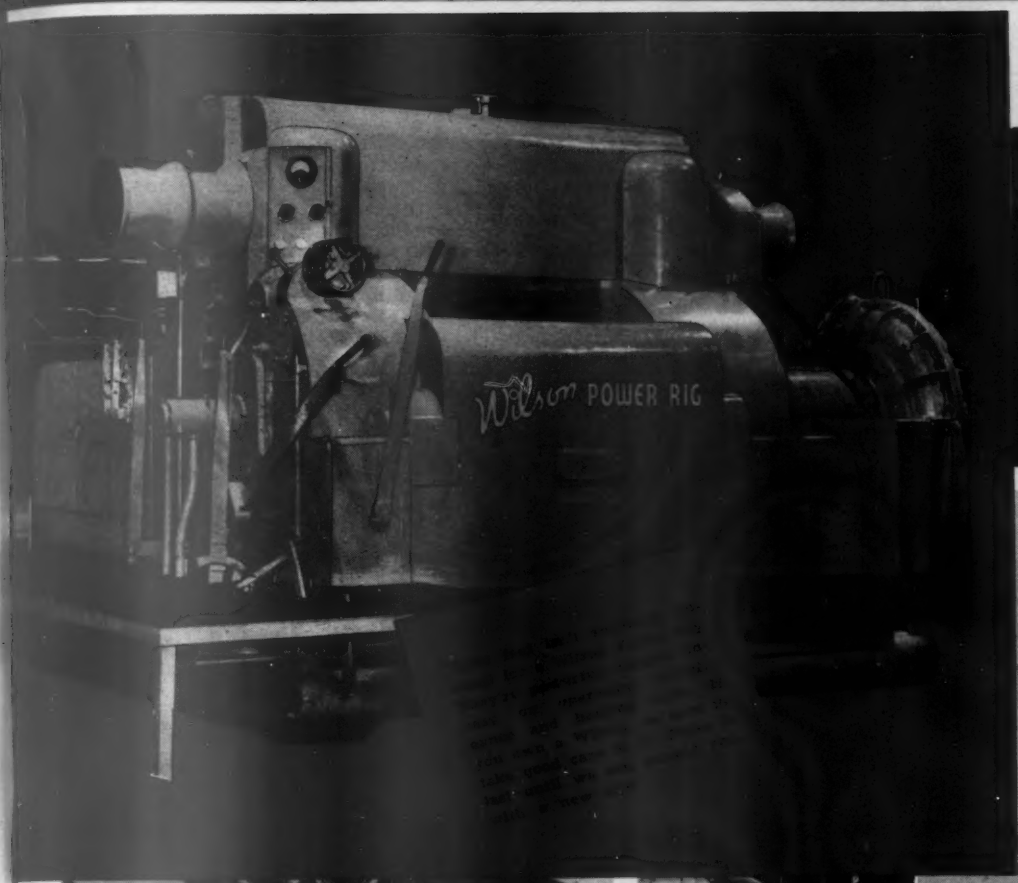
DEPENDABLE GULF STATES UTILITIES CO. PUBLIC SERVICE



Flame hardened, polished Brake Rings

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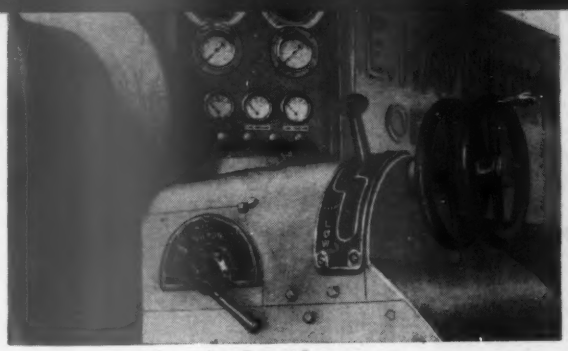
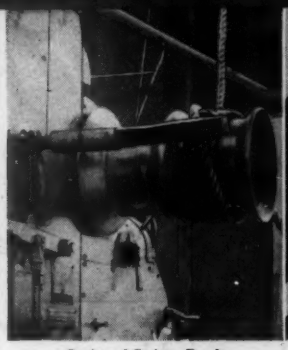


Convenient Control Arrangement



Cathead Safety Device

Air Controlled Chain Drive Transmission

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BUT THE WILSON RIG OF TOMORROW WILL BE EVEN FINER, MORE PERFECT AND POWERFUL

Just because we are engaged at present with "knocking out the enemy," don't think we are asleep as far as oil field winches and power rigs are concerned. Wilson features which set the pace for many years, and which hold the lead even today, will take a backseat for the developments and improvements we have in store for you tomorrow. Just be patient. We are doing everything we can to supply your needs now and prepare for the demands for Wilson equipment when critical materials become more available.

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PACIFIC COAST DISTRIBUTOR • H. & B. SALES CO., LTD. • LONG BEACH • CALIFORNIA

Wetzel County, Church district: David Oil & Gas Co. 1 Vernon Snider, 38,000 cu. ft. gas, Fifth sand, T.D. 3,467 ft.

Wood County, Walker district: South Penn Natural Gas Co. 1 Robert Chalfant, dry, through Gordon sand, T.D. 3,000 ft.

Wyoming County, Oceana district: Godfrey L. Cabot, Inc. 1078 Watts Land Co., dry and plugging, T.D. 5,993 ft.

ORISKANY GAS FIELDS

Jackson County, Ripley district: United Carbon Co. 1089 Elizabeth W. Perkins, 4,138,000 cu. ft. gas before shot, Corniferous lime 5,017 ft., Oriskany 5,130 ft., R.P. 1,720 lb., T.D. 5,168 ft.

Columbian Carbon Co. and United Carbon Co. 710 O. C. Williams, 440,000 cu. ft. gas, Big lime 2,031 ft., Berea 2,633 ft., Corniferous lime 5,169 ft., Oriskany 5,270-5,315 ft., lime break 5,315-27 ft., Oriskany 5,327-40 ft., shot 5,270-5,310 ft., R.P. 1,275 lb., T.D. 5,344 ft.

CANADIAN FIELDS

Second Taber Well May Be Better Than Discovery

CHATHAM, Ont.—In the Taber field, southern Alberta, Dominion Oils 37-18B, LSD 15, 18-9-16w4, offsetting Taber-Province 1 discovery well to the northwest, found oil at 3,156 ft. The oil rose 1,700 ft. in the casing in 1¼ hour, indicating an even better producer than the discovery well which in May pumped 5,722 bbl. in 26 days. The well was cored to 3,156 ft., showing 16 ft. of oil sand, 2 ft. of shale and an additional foot of oil sand at bottom. The electrolog later indicated coring had not commenced early enough to get the top of the producing sand. The 7-in. casing was run and a definite production test is being made. Dominion Oils C.P.R. 75-17 B has been spotted in LSD 5, 17-9-16w4, as a southeasterly offset to the discovery well, testing the theory that production trends southeast and northwest in line with the Cole-Hunter deep test on the Oldman River, drilled about 10 years ago, and which got a 9-ft. saturated sand.

Turner Valley key tests. — In the Turner Valley north extension, Northwest-Hudson's Bay 13, LSD 9, 8-21-3w5, which after drilling two normal porous zones of the Madison limestone, faulted back to the upper formations, reentered the Madison at 9,012 ft. The well has since drilled through a third porous zone in this second occurrence of the Madison, encountering water-free oil, and is standing at 9,193 ft.

In North Turner Valley, Royalite Oil 66, LSD 6, 34-20-3w5, east flank test, has encountered deep faulting, getting the belemnite, normally just above the lime, at 9,100 ft. and faulting back to upper Blairmore, 9,200 ft.

In the southwest extension, Brown Oil Corp. 6, LSD 15, 5-18-2w5, most southerly test in the field and southeasterly offset to Northwest-Hudson's Bay 8, the most southerly producer, got the Kootenay-Fernie contact at 8,240 ft. and is getting close to the Madison limestone. Imperial-Hudson's Bay 15, LSD 1, 8-18-2w5, offsetting Brown 6 to the northeast, is in lower Benton at 5,689 ft., logging somewhat higher than the Brown well. If production is encountered in these wells it will open a considerable area to the south for still further development.

Twin River. — On the Twin River structure, Pacific Oil & Refining Co. of Alberta is arranging to operate the E. L. Cord and associates well, which has an estimated potential output of 40 bbl. of light crude, but has never been put on steady production. From intermittent production, some 2,000 bbl. of crude have been accumulated in storage at the well. Pacific Oil & Refining is planning to put the Cord well on the pump and truck the crude to its refinery at Lethbridge.

Edgerton.—In the Edgerton district, east-central Alberta, C. H. Withers is spudding for Edgerton Oils in LSD 1, 19-43-4w4. The company, headed by Sidney Pawsey of Edgerton and R. Price of Edmonton, has given contract for 2,200 ft. if production is not encountered sooner. The well is in a new area, west of the Dunn area in which London-Ribstone Oils 1 some years ago encountered substantial shows of oil in the lower Cretaceous formation between 2,132 and 2,158 ft. with additional shows in underlying shale and sandstone formations.

Ruggedness and dependable accuracy, too, distinguish the ALL-METAL THERMOMETER

Readability in an indicating thermometer is an outstanding advantage *if* full dependence can be placed on each reading. Thus the WESTON thermometer has been widely adopted throughout the process industries: because it provides both these essential factors . . . readability and dependability . . . without compromise. It's simple, all-metal temperature principle . . . minus gases, liquids, capillary and involved mechanisms . . . assures "on-the-dot" accuracy over a far longer period of time. In addition, this all-metal construction safeguards against failures due to vibration or over-ranging. *You're more certain of your reading . . . with a* WESTON.

WESTON all-metal thermometers are supplied in types and diameters for most industrial applications and in stem lengths from 2½ to 24". Accuracy, over the entire scale, guaranteed within 1% for the industrial models . . . ½ of 1% for the laboratory model. Literature gladly sent on request, although production facilities are at present devoted solely to the war effort. Weston Electrical Instrument Corporation, 673 Frelinghuysen Avenue, Newark, N. J.

WESTON ALL-METAL *temperature Gauges*

MICHIGAN

Plans to Study Outcrops on Edge of Basin Announced

SAGINAW, Mich. — Extending the Michigan Department of Conservation search for new oil resources in Michigan, two University of Michigan geologists have begun a 3-month study of rock formations in the Mackinaw City-St. Ignace area.

Purpose of the study, by Prof. Kenneth K. Landes, chairman of the university's department of geology, and Associate Prof. George M. Ehlers, is to map the oil-bearing rock formations of northern Michigan which rise gradually from depths to more than 4,000 ft. in present Michigan oil fields to crop out on the surface on both sides of the Straits of Mackinac. By identifying and mapping these outcroppings and making studies of underground formations further south in present oil-producing areas, the geologists hope to be able to map the strata for the in-between areas.

Current drilling operations in Michigan continued their stepped-up rate during the past week with 17 completions recorded development interest centering chiefly on another big well brought in in the Mecosta County Fork field, a wildcat producer in Ottawa County's Holland Township, a bigger-than-usual producer in Monitor Township, Bay County, and a small wildcat well developed in Huron Township, Wayne County. In addition the report showed two other oil producers, three more natural-gas wells totaling 11½ million cu. ft. in Clare County, and eight dry holes, six of those being wildcat tests.

Best of the new oil wells is Smith Petroleum Co. 1 Plummer in Section 7 of Fork Township, which came in for 833 bbl. a day natural at 3,856 ft. The Ottawa wildcat, Regal Dutch Petroleum Co. 1 Bosch-Walters in Section 36 flowed 365 bbl. in 24 hours after acidizing. Gulf Refining Co. reported initial after-acid production of 350 bbl. a day from its 1 Collins in Section 1 of Monitor, Bay County. The Wayne County wildcat producer drilled to 2,737 ft. in Section 8 of Wayne Township by Voorhees Drilling Co. was pumping 5 bbl. a day after acid treatment. Taggart Brothers Co. completed the three Clare gas wells.

The Oil and Gas Association of Michigan production data revealed crude-oil output in the state now is at the highest level of the year after averaging 59,224 bbl. a day from 3,331 wells during May.

MICHIGAN COMPLETIONS

Allegan County, Manlius Township: Charles W. Cook 1 Kalmink, SW SW SE 3-3n-15w, wildcat, dry, T.D. 1,390 ft.

Cheshire Township: W. A. Roung and S. F. Clark 1 Merriam, SW SE SE 36-1n-14w, dry, T.D. 1,563 ft.

Arenac County, Deep River Township: Ervin Major 1 State, NW NW 31-19n-4e, dry, T.D. 4,234 ft., P.B. to 4,222 ft.

Bay County, Monitor Township: Gulf Refining Co. 1 Collins, N½ SW NW 1-14n-4e, pumping 350 bbl., acidized, T.D. 2,835 ft.

Clare County, Winterfield Township: Taggart Brothers Co. S-4, NE 1-20n-6w, 4,170,000 cu. ft. gas, T.D. 1,323 ft.

Summerfield Township: Taggart Brothers Co. S-5 Sterling-State, NE 7-20n-5w, 3,230,000 cu. ft. gas, T.D. 1,323 ft.

Taggart Brothers Co. S-6, SW Sec. 8, 4,050,000 cu. ft. gas, T.D. 1,290 ft.

Crawford County, Beaver Creek Township: Freeman Oil Co. 1 Corning, NE SE 22-25n-4w, wildcat, dry, T.D. 4,650 ft.

Gladwin County, Bentley Township: Sun Oil Co. 2 Davies et al, SE SW SE 17-17n-2e, pumping 65 bbl., acidized, T.D. 3,600 ft.

Kent County, Plainfield Township: S. L. McCall 1 Schaap, SE NW 25-8n-11w, wildcat, dry, T.D. 2,066 ft.

Lapeer County, Mayfield Township: Chapman Oil Co. 1 Myers, E½ NE NW 5-8n-10e, wildcat, dry, T.D. 1,501 ft.

Mecosta County, Fork Township: Smith Petroleum Co. 1 Plummer, S½ SE SE 7-16n-7w, 833 bbl., natural, T.D. 3,856 ft.

Newaygo County, Everett Township: Charles W. Teater 1 State, S½ SE SW 30-13n-12w, wildcat, dry, T.D. 3,225 ft.

Ottawa County, Holland Township: Regal Dutch Petroleum Co. 1 Bosch-Walters, S½ NW SE 36-5n-15w, wildcat, flowed 365 bbl. first 24 hr., acidized, T.D. 1,503 ft.

Zeeland Township: Howard E. Fowler A-1 Geerling-Baron comm., SE SE NW 31-5n-14w, pumping 65 bbl., and salt water, T.D. 1,474½ ft.

Van Buren County, South Haven Township: W. H. Clock 1 Kanter, NE NE NE 13-1s-17w, wildcat, dry, T.D. 1,142 ft.

Wayne County, Huron Township: Voorhees Drilling Co. 1 Otter, NE SW NE 8-4s-9e, wildcat, pumping 5 bbl., acidized, T.D. 2,737 ft.

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"... with U-Bolt Entirely Embracing the Chambers"

greater **STRENGTH**

greater **DURABILITY**

IN the JERGUSON Reflex Gage, every bolt is a U-Bolt, holding the entire assembly as in a vise. Sections and assembled parts cannot get out of line. The entire assembly stays gas-tight and liquid-tight throughout long periods, regardless of fluctuations in temperatures and pressures.

Standard JERGUSON Reflex Gages are made for the pressures and temperatures usually encountered in refineries, natural gasoline and other plants.

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WHERE YOU ARE A STRANGER ONLY ONCE

WALK into the nearest Oilwell Store. You won't feel like a stranger. You'll be impressed by the friendly, helpful spirit of the personnel.

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These are just a few of the plus values of "Oilwell's" 10-Point Supply Service. You'll discover the others when you visit an "Oilwell" store—where you are a stranger only once.

SUPPLY SERVICE

3. ADEQUATE WAREHOUSING TO PROTECT MATERIAL AND SPEED DELIVERIES

To assure prompt deliveries and provide the best possible care and protection for materials in stock, "Oilwell" has a new and efficient warehouse system. Each division has a large central warehouse with reserve stocks of miscellaneous supplies for the branch stores in its territory. Each division also has a number of district warehouses in which machinery and sucker rods are stored under cover. These warehouses are located at points assuring convenient short-hauls direct to customers' leases.

4. CONVENIENT STORE LOCATIONS

"Oilwell" field stores are located where they will provide maximum convenience for the greatest possible number of operators. It would not be feasible to maintain a store in every field, but "Oilwell" stores are located where they can serve all oil and gas fields in the United States and Canada.

5. FIELD ENGINEERING ASSISTANCE

"Oilwell's" field engineers are trained and experienced in helping customers in the proper selection, installation, operation and maintenance of equipment. Many times their recommendations result in the elimination of equipment failures and the lowering of operating costs. They are always available to plan and supervise turnkey installations.

6. PRODUCT DESIGN AND METALLURGY KEYED TO YOUR NEEDS

"Oilwell's" supply service includes the designing and development of new equipment and improved materials that will best suit specific oil and gas field needs. Many outstanding advancements have been pioneered by "Oilwell".

7. EXTENSIVE MANUFACTURING AND TESTING FACILITIES

Much of the equipment distributed by "Oilwell" is made right in "Oilwell's" own plants, where experienced craftsmen with modern machine tools build products--from the design up--for oil field service. Careful inspecting and extensive testing assure high standards of quality and performance. Contributing much to "Oilwell's" own facilities are the raw material resources, the manufacturing capacity and the research and testing laboratories of United States Steel Corporation.

8. HIGHEST GRADE SUPPLIES FOR OIL AND GAS FIELD NEEDS

In purchasing many thousands of items for resale, "Oilwell" feels a genuine responsibility to its customers and buys only from sources of proved reliability. Just as materials purchased for fabrication in "Oilwell" plants are carefully inspected for uniformity of quality, so are those items which are stocked for sale to "Oilwell" customers.

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"Oilwell," through years of experience, has gained a thorough understanding of the oil man's financial problems, and has the resources and facilities for rendering efficient credit service.

10. 81 YEARS OF PRACTICAL EXPERIENCE

The experience gained in serving the oil industry continuously throughout all stages of field developments, wars and other emergencies of the past 81 years, makes "Oilwell" better able to serve its customers under today's unusual conditions. Carrying on under emergency restrictions is no new experience for "Oilwell".

OIL WELL SUPPLY COMPANY

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Branch Stores Serving All Oil Fields
United States Steel Corporation Subsidiary

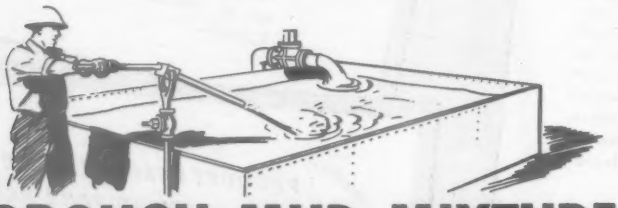
EXPORT DIVISION OFFICE—
30 ROCKEFELLER PLAZA
NEW YORK CITY

Wildcat Southeast of Mankins Shows Oil in Second Lime Pay

WICHITA FALLS, Tex.—Frank Buttram 1-B John O'Donohoe, wildcat in Section 104, A.T.N.C.L. subdivision, 7 miles southeast of Mankins, Archer County, which last week showed oil in Caddo lime topped at 4,747 ft., topped Mississippi lime at 5,050 ft., showing oil to 5,080 ft., and set 7-in. casing to test. The well is being kept "tight," and it is not sure whether this formation is Mississippi or detrital overlying Ellenburger, but electrical survey was run and results are believed to be very favorable. Material was being moved in for another wildcat in Archer County, A. R. Dillard 1 Luke W. McCrory, trustee, SW NE Section 83, A.T.N.C.L. subdivision, 5,500-ft. rotary test 7 miles southeast of Holliday.

Clay County.—East of the Joy-Mississippi pool, L. T. Burns 1 Joe P. Thompson, Block 29, San Augustine University Survey, passed up good shows of oil from 3,850-68 ft., and 4,545-60 ft., carrying good kick, but did not test, and was drilling ahead below 4,700 ft. for the Mississippi lime which produced 12,000 bbl. per day at Consolidated Oil 1 Viola Myers, extending the Joy pool ½ mile northwest 2 weeks ago.

Young County.—The Bunger area, south part of the county, received a new Ellenburger test at Deep Rock Oil Co. 1 R. L. Morrison, 330 ft. from south and east lines of north half F. McLaurin Survey, A-211. Derrick has been erected and tools were being moved in. The hole is to be carried to 4,700 ft., and is located 2 miles east of Bunger. Standard Oil Co. of Texas and Hanlon-Buchanan, Inc., 1 R. T. Wells, Section 738, T.E.&L. Survey, 3 miles south of Proffitt, topped Caddo lime at 3,869 ft., had show of oil to 3,872 ft., and a core from 3,872-77 ft. recovered 2 ft. lime showing oil, and was drilling ahead.



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MUD GUN

Mixing of rotary mud is a very important operation in the drilling of oil wells. A Gun for this service should be safe, economical in operation, and low in cost. Ordinary fittings when used for this purpose soon cut out and failure may take place at a time when a workman might be injured, or at a time when mixed mud is most important to the well's operations. The majority of Mud Guns sold during recent years have been made by Patterson-Ballagh. See Composite Catalog.

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Los Angeles Houston New York City

NORTH TEXAS COMPLETIONS

Wildcats

Archer County: W. D. Cline 1 F. J. Henry, Sec. 36, Clark & Plumb subd., Blk. 5, dry, T.D. 918 ft.

J. L. McMahon et al 1 A. J. DeMoss, 330 ft. from S, 600 ft. from E, Lot 17, Blk. 5, Clark & Plumb subd., dry, T.D. 1,122 ft.

Louis Sikes 1 Turbeville est., Sec. 34, J. W. Harris subd., dry, T.D. 1,460 ft.

Montague County: G. S. Marvin 1 G. E. Lemon, M. Burnsides Sur. A-14, dry, T.D. 1,780 ft.

Stanolind Oil & Gas 1 A. A. Cobb, 705 ft. from S, 660 ft. from E, 118.35-ac. tract, Sec. 2830, T.E.&L. Sur., Marble Falls lime 6,312 ft., Barnett shale 6,312-28 ft., Simpson 3,751 ft., Simpson dolomite 7,129 ft., dry, T.D. 7,297 ft.

Fields

Archer County: Akin & Dimock 1 McCrory, Sec. 121, A.T.N.C.L. subd., dry, T.D. 1,446 ft.

Fargo, Wilbarger County: Humble Oil & Ref. 6 W. O. Anderson, 880 ft. from S, 1,760 ft. from E, N½ Sec. 33, Blk. 15, H.&T.C. Ry. Sur., pump 52 bbl., pay sand 4,056 ft., T.D. 4,067 ft.

Hardin, Wichita County: Ernest Prod. 2-A F. P. Warren, W. J. Smith Sur. A-678, dry, T.D. 1,560 ft.

Hoefle, Jack County: Gerhig Corp. of Ark. 1 Mary Hoefle, 1,283 ft. from S, 467 ft. from W, Sec. 1, S.F.I.W. Sur., dry, T.D. 4,907 ft.

Iowa Park, Wichita County: Coppock & Coleman 1-D Kempner, Blk. 47, K.W. V.F.L. subd., dry, T.D. 1,780 ft.

Myers, Jack County: Hanlon-Buchanan Inc. 1 Geo. Myers, 1,399 ft. from S, 267 ft. from W, Sec. 1, S.P.R.R. Sur., dry, T.D. 3,701 ft.

Larimore, Young County: Farmer & Hansen 1 J. K. Jeffery, Sec. 49, T.E.&L. Sur., dry, T.D. 884 ft.

Olney, Young County: R. Horany 1 T. Gad-

berry, Sec. 227, T.E.&L. Sur., dry, T.D. 1,005 ft.

Parrott, Throckmorton County: Humble Oil & Ref. 1 G. R. Lunsford, 660 ft. from S & E, Sec. 948, T.E.&L. Sur., pump 20 bbl. oil, 180 bbl. water, lime pay 4,062 ft., acid 5,000 gal., T.D. 4,079 ft.

Portwood, Baylor County: Consolidated Oil 5-Z W. H. Portwood, C E½ SW Sec. 1573, T.E.&L. Sur., S.S.O. 1,354-64 ft., dry, T.D. 1,395 ft.

Swastika, Archer County: C. G. Butts 1 J. T. Richardson, Lot 1, M.E.P.&P. Sur. A-715, dry, T.D. 1,245 ft.

Thornberry, Clay County: Akin & Dimock 2 Joe Stephenson, Lot 55, Specht & McCutcheon subd., dry, T.D. 1,182 ft.

Bridwell Oil 17 Saner, G.C.&S.F. Ry. Sur. A-794, pump 12 bbl., pay sand 1,120 ft., T.D. 1,134 ft.

Vogtsberger, Archer County: Fain & McGaha 1 Emma Thorman, 467 ft. from N and E, NW Sec. 11, Blk. 1, H.&T.C. Ry. Sur., flow 752 bbl., lime pay 4,681-4,750 ft., T.D. 4,752 ft.

WEST CENTRAL TEXAS

ABILENE, Tex.—Deep production possibilities of the area 1 mile southwest of the Lewis pool, Jones County, will be tested by Hunter & Hunter 1 Bert Fields, 660 ft. from south and west lines, N½ Section 48, Block 15, T.&P.R.R. Survey, which is slated to go to 5,200 ft. This depth should take it through the Strawn series, into the Bend group. It will be the deepest test ever drilled in this area, nearest deep test being 1½ miles northwest, in Section 29, Block 15, T.&P.R.R. Survey, which went to 4,919 ft.

Since new regulations permitting drilling on closer than 40-acre spacing, seven new locations have been staked in the Wimberly pool, and the whole pool is expected to be drilled to a density of one well to 20 acres within the next 12 months.

Ben F. Read, trustee, 1 W. A. Corbett, 660 ft. from north and west Section 1092, T.E.&L. Survey, 4 miles east of Ivan and 2 miles south of T. G. Shaw 1 Whalen gasser, opened a new flush producing area in northeast Stephens County when it flowed at the rate of 50 bbl. per hour from perforations opposite the Lake sand at 3,938-60 ft. Bottomed at 4,242 ft., in lower Bend formation, 5½-in. casing was set. The oil tests 43.8 gravity, and is being taken by Texas Pipe Line Co.

WEST CENTRAL TEXAS COMPLETIONS

Wildcats

Shackelford County: Roeser & Pendleton and Continental Oil 1-A W. I. Cook est., SE NE SW Sec. 111, E.T.R.R. Co. Sur., dry, T.D. 1,751 ft.

Taylor County: Drilling & Exploration Co. 1 Gibson, SE NE Sec. 8, Blk. 147, Grimes County School Land Sur., dry, T.D. 5,466 ft.

Fields

Bluff Creek, Shackelford County: Roeser & Pendleton, Inc. and Humble Oil & Ref. 55 J. P. Morris, 220 ft. from S, 226 ft. from W, NE Sec. 205, E.T.R.R. Sur., elev. 1,320 ft., pump 39 bbl., pay sand 1,577 ft., T.D. 1,593 ft.

Merkel, Taylor County: Lewis Prod. 2 O. R. Golightly, SE SW Lot 7, Lge. 124, Grimes County School Land, elev. 1,782 ft., I.P. 225 bbl., pay 2,601-12 ft., T.D. 2,615 ft.

Nail, Shackelford County: R. H. Roark 6 J. H. Nail, 1,980 ft. from E, 660 ft. from N, Sec. 136, E.T.R.R. Sur., I.P. 210 bbl., pay sand 1,499 ft., T.D. 1,515 ft.

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CALIFORNIA

Wildcatting and Leasing on Increase in San Joaquin Valley

LOS ANGELES, Calif. — Considerable leasing activity is present in San Joaquin Valley areas and this may mean the start of several new wildcats in the not far distant future. Continental Oil Co. and Standard Oil Co. have done considerable leasig south and southeast of the Greeley field and Union Oil Co. has taken a number of leases south and southeast of the Rio Bravo field. Shell's latest wildcat program contemplates a wildcat to be drilled in the Kern River district southeast of present production. This company has taken leases on about 500 acres of potentially productive acreage in 8-29s-29e, 18-29s-29e and 12-29s-28e.

Fresno County.—Superior's discovery well in the Wheatville district of Fresno County has been beaned back and is at present flowing 75 bbl. of clean 40.4-gravity oil per day through a 7/64-in. bean along with 75,000 cu. ft. of natural gas. This is one of the most surprising completions in the San Joaquin Valley in a long time as Superior Oil Co. did not make a formation test of this Miocene sand until after the discovery well had been drilled to 9,562 ft. and bottomed in a barren gray sand. A dry hole northwest of this completion limits field development in this direction unless the Miocene sand was likewise passed up as of no importance. The Miocene sand found in Superior's discovery well is quite thin.

Kern County.—Drilling operations in Kern County fields continues at an even keel and judging by the number of new locations staked the present drilling rate will continue for the remainder of the year provided drilling and producing equipment is available. Several companies are salvaging equipment from old San Joaquin Valley wells in order to provide equipment for current completions. Very little deep drilling is under way in the San Joaquin Valley but it may be necessary to step up deep zone development to maintain production rates. The chief problem confronting operators with flush and semiflush fields is gas distribution as the conservation committee has turned thumbs down on gas waste in which position it will have the merited support of the entire industry. This problem may be further complicated with the advent of warm weather which always results in reduced demand for natural gas.

SAN JOAQUIN VALLEY COMPLETIONS

Antelope Hills wildcat district, Kern County: E. B. Hall & Co. 17-56 Theta, 17-28s-20e, dry, T.D. 1,833 ft., recovered small amount of heavy oil.

Belridge, South, Kern County: Belridge Oil Co. 78-34-A fee, 34-28s-21e, pumped 75 bbl., 14.3°, 10 per cent cut, T.D. 790 ft., perf. 432-790 ft., in South Belridge zone of Pleistocene age.

C.C.M.O. Co. 11-3 B.F., 11-29s-21e, pumped 7 bbl. net, 13.9°, 80 per cent cut, T.D. 2,463 ft., perf. 1,135-60 ft.

Shell 51-12 F.K.L., 12-29s-21e, pumped 102 bbl., 15°, 2 per cent cut, T.D. 1,110 ft., P.B. 1,063 ft., perf. 925-47 ft., 974-1,029 ft., 1,070-80 ft.

Buena Vista Hills, Kern County: Standard 37-11-D, 11-32s-24e, pumped 36 bbl., 19.9°, 2 per cent cut, T.D. 2,900 ft., perf. 2,834-96 ft., in upper Buena Vista zone of Pliocene age.

Standard 87-11-D, 11-32s-24e, pumped 36 bbl., 27.5°, 3 per cent cut, T.D. 2,798 ft., perf. 2,729-95 ft.

Standard 117-15-D, 15-32s-24e, pumped 25 bbl., 25.2°, 0.9 per cent cut, T.D. 2,829 ft., perf. 2,732-2,827 ft.

Standard 84-35-B, 35-31s-23e, pumped 50 bbl., 26.9°, 20 per cent cut, T.D. 3,412 ft., perf. 2,759-2,888 ft., 3,105-3,410 ft., in lower Buena Vista zone of Pliocene age.

Union 17 McLeod, 34-31s-23e, pumped 79 bbl. net, 25.8°, 62 per cent cut, T.D. 3,602 ft., perf. 3,331-3,583 ft.

Coalinga, East, Fresno County: Shell 148-29 fee, 29-19s-15e, pumped 96 bbl., 20.4°, 1 per cent cut, T.D. 2,310 ft., pref. 2,211-41 ft., 2,271-2,302 ft., in East Coalinga zone of Miocene age.

Shell 157-26 fee, 26-19s-15e, pumped 228 bbl., 19.9°, 0.1 per cent cut, T.D. 3,080 ft., perf. 2,715-2,879 ft., 2,969-3,067 ft.

Standard 107-7-C fee, 7-20s-15e, pumped 23 bbl., 17.2°, 8 per cent cut, T.D. 2,228 ft., perf. 2,125-2,225 ft.

Elk Hills, Kern County: U. S. Navy 32-34-S, 34-30s-24e, pumped 415 bbl., 20.7°, 0.1 per cent cut, T.D. 3,020 ft., perf. 2,909-57 ft., 2,973-3,017 ft., in Tupman zone of Pliocene age.

Greeley, Kern County: Standard 11-37 Kern County Land, 18-29s-26e, flowed 370 bbl., 35.5°, 0.3 per cent cut, 500,000 cu. ft. gas, 12/64-in. bean, pressures 400/1,000 lb., T.D. 11,510 ft., perf. 11,360-11,508 ft., Rio Bravo zone of Miocene age 11,428 ft., Vedder zone of Miocene age 11,468 ft., completed in both zones.

Kern Front, Kern County: Pacific Western Oil Co. 16-A Robinson, 22-28s-27e, pumped 42 bbl., 41.1°, 16 per cent cut, T.D. 2,338 ft., perf. 2,191-2,336 ft., in Kern Front zone of Pliocene age.

Standard 41-15 fee, 15-28s-27e, pumped 24 bbl. net, 14.1°, 50 per cent cut, T.D. 2,310 ft., perf. 2,165-2,308 ft.

Midway-Sunset, Kern County: C.C.M.O. Co. 54-9 fee, 9-32s-23e, pumped 8 bbl., 14.3°, 13 per cent cut, T.D. 1,670 ft., perf. 1,597-1,661 ft., in Midway zone of Pliocene age.

Standard 67-31-E Maricopa, 31-12n-23e, flowed 180 bbl., 25.1°, 1 per cent cut, 160,000 cu. ft. gas, 32/64-in. bean, tubing pressure 170 lb., T.D. 2,671 ft., perf. 2,620-55 ft., in Wilhelm zone of Pliocene age.

Standard 109-31-E Maricopa, 31-12n-23e pumped 3 bbl., 23.1°, 1 per cent cut, T.D. 2,012 ft., P.B. 1,890 ft., in upper Midway-Sunset zone of Pliocene age.

Trico Oil & Gas Co. 1 Petersen, 18-31s-22e, dry, T.D. 1,049 ft

Mount Poso, Kern County: Ring Oil Co. 29-22 Bowles, 29-26s-28e, dry, T.D. 1,837 ft., fault at 1,825 ft., Vedder zone of Miocene age, 1,832 ft., bottomed in barren gray sand, small showing in Jewett zone.

Rio Vista gas field, Sacramento County: Standard 4 State, 12-3n-2e, flowed 17,512,000 cu. ft. gas, 48/64-in. bean, flowing pressure 1,590/1,450 lb., shut-in pressure 1,596/1,600 lb., T.D. 5,517 ft., perf. 5,177-5,454 ft., in Emigh zone of Eocene age.

Tupman, Kern County: Richfield 43-32-A Kern County Land, 33-30s-25e, flowed 658 bbl., 35.1°, 1 per cent cut, 650,000 cu. ft. gas, two 96/64-in. beans, pressures 150/752 lb., T.D. 9,000 ft., perf. 8,816-98 ft., in Stevens zone of Miocene age.

Drilling Increases At Wilmington

Drilling operations are showing a little increase in the Wilmington field of Los Angeles Basin but have not reached the maximum anticipated a few months ago. Late last year Union Pacific Railroad Co. asked PAW for authority to drill 50 Ranger and Tar zone wells on the basis of one well to each 10 acres but was denied permission to do so. Since that time the company has reduced development work at Wilmington to reconditioning and redrilling jobs but recently started three new wells. It is strange that PAW continues to cling to its arbitrary rules which penalize fields having two or more separate zones when the Navy Department is asking California marketers to maintain as large stocks of fuel oil as possible in order to be able to make substantial deliveries in case of necessity. Continental Development Corp. has staked location for five more wells to be drilled on property leased from the Los Angeles County Flood Control District and on which 19 wells have already been drilled and completed.

Orange County. — Because of the shallow depth at which production is found, some idea should be available as to the extent of the oil accumulation found a short time ago by D. W. Elliott in the Newport Beach area southeast of the Huntington Beach field. A second well is under way and with only a few hundred feet of hole to make should reach the top of the productive interval within another day or so. Standard Oil Co. has locations staked for four additional wells to be drilled in the West Coyote field on the Emery and Murphy Coyote properties. Standard has pursued an aggressive development program all year and expects to average one well per day during 1943. Many of these wells are shallow and, while they show relatively small production, in the aggregate they amount up. In the East Coyote field, Bartholomae Oil Corp. is putting the

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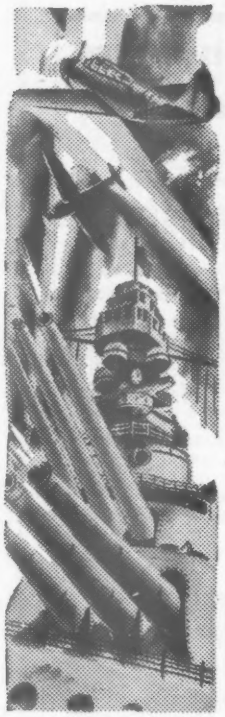

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finishing touches on 13 Sterns which picked up the top of the pay at 4,350 ft. Drilling operations in the Huntington Beach have shown some little increase during the past few weeks but no great amount of new work is expected unless tideland development is authorized. Signal Oil & Gas Co. with one well drilling has four additional locations staked and Southwest Exploration Co. presents the same condition. Standard with one string of tools in operation has two additional locations ready for work when crews become available.

LOS ANGELES BASIN COMPLETIONS

Dominguez, Los Angeles County: Shell 130 Reyes, 33-3s-13w, dry, T.D. 8,992 ft., stratigraphically below the eighth Callender zone of Miocene age.

Union 54 Hellman, 33-3s-13w, pumped 61 bbl. net, 30.9°, 25 per cent cut, T.D. 4,485 ft., perf. 4,318-4,485 ft., in first Callender zone of Pliocene age.

Montebello, Los Angeles County: Standard 105 Baldwin, 36-1s-12w, pumped 50 bbl. oil, 16.8°, 28 bbl. water, T.D. 2,820 ft., perf. 2,234-2,819 ft., in Baldwin zone of Pliocene age.

Wildcat Staked Near Chatsworth Reservoir

Anderson-Prichard Oil Corp. has spudded 1 Ramsey-Chatsworth at the north end of the Chatsworth reservoir on property leased from the Los Angeles metropolitan water district in 24-2n-17w. This wildcat is located in an area that has been in and out of the news for more than a year and was located because of gas seepages in and adjacent to the reservoir. The immediate area has been favorably reported on by several geologists and for this reason the outcome of drilling will be watched with interest. In the

Ventura and Santa Barbara counties.—In the Gato Ridge field, Barnsdall has concluded drilling operations on 6 Tognazzini in 9-8n-32w, at 3,767 ft. but will not know for another day or two whether the well will be commercially productive as the company still has 3,500 bbl. of circulating oil to recover. This well has been completed in the lower zone which is the more productive of the two developed to date. Union Oil Co. which was born in Ventura County has returned to the scene of its first successes and is preparing to drill a deep test on the Torrey property in the Torrey Canyon field of Ventura County. Union's attempt to redrill and return 1 Hartnell to production in the Santa Maria area has met with partial success although production of the well shows a high water cut which may be due to formation water or edgewater.

COASTAL DISTRICT COMPLETIONS

Cat Canyon, Santa Barbara County: O. C. Field Gasoline Corp. 1 Williams, 32-9n-32w, dry in brown shale, T.D. 3,940 ft.

Santa Maria Valley, Santa Barbara County: Bel-Air Oil Co. 1 Twitchell-Wedging, 35-10n-34w, pumped 425 bbl. net, 13.8°, 15 per cent cut, T.D. 5,420 ft., perf. 4,895-5,420 ft., in Monterey of Miocene age.

TEXAS GULF COAST

New Field in Prospect Northeast of Van Vleck

HOUSTON, Tex.—Superior Oil Co. of California seems in a fair way to open a new pool in Matagorda County with its 1 F. B. Peterson, 3 miles northeast of Van Vleck. On a 12-hour drill-stem test the well flowed at an estimated rate of 275 bbl. of 53-gravity oil daily through 23/64-in. choke from perforations at 9,754-64 ft. Tubing pressure was 2,800 lb. and gas-oil ratio 28,400. The well began to make fresh water, and perforations were squeezed preliminary to further testing. At latest report tests were being made with perforations at 9,754-59 ft.

Chambers County.—No shows had been reported as the week closed at Arkansas Fuel Oil Co. 1 Annie Frankland, projected 10,500-ft. test in the R. C. Frankland Survey. Operator was coring at 8,720 ft. The large Discorbis and Gyroidina were topped at 7,402 ft., Heterostegina 7,755 ft., Round Marginulina 7,997 ft. Wynn Crosby Drilling Co. et al 1 J. E. Jackson, 15 miles south of Anahuac, was drilling in shale at 9,084 ft.

Jefferson County.—Shell and Humble 1-C McFaddin Trust, 5 miles southeast of La Belle field, continues to show gas. It was drilling at 8,564 ft. in shale at the week end. Texas Co. 1 Broussard et al, 7 miles southeast of Nome, was at 6,521 ft. in shale.

TEXAS GULF COAST COMPLETIONS

Wildcats

Hardin County: Northern Ordnance, Inc., 1 Weiss-Hudson, 5 mi. SE of Batson, dry at 8,479 ft.

Jackson County: Stanolind 1 Joseph Wearden, 3 mi. E of Cordelie, dry at 5,300 ft.

Jasper County: Houston Oil Co. and American Republics Corp. 1 Castillo fee, 5 mi. NW of Buna, dry at 7,406 ft.

Wharton County: Sam G. Harrison et al 1 Wallace & Hancock, 2 mi. S of Hilje, dry at 5,611 ft.

Fields

Clodine, Fort Bend County: Wynne Crosby Drilling Co. 1 Terry-Jones et al, J. Brock Sur., A-110, 165 bbl. through ⅛-in. choke, T.P. 800 lb., C.P. 1,150 lb., gas-oil ratio 360, perf. 7,502-04 ft., T.D. 7,535 ft.

Friendswood, Harris County: Humble 4 G. M. Anderson, T. Choate Sur., A-12, 240 bbl. through ¼-in. by 6-in. chokes, T.P. 250 lb., S.I. C.P. 500 lb., gas-oil ratio 298, T.D. 6,077 ft.

Ganado, Jackson County: Texas 2 Otto C. Hulquist, O. S. York Sur., 90 bbl. through ⅛-in. choke, T.P. 400 lb., gas-oil ratio 263, perf. 5,442-50 ft., T.D. 6,565 ft.

Katy, Waller County: Kirby Petroleum Co. 1 T. W. Beckwith, H.&T.C. Sur., 208 bbl. through 10/64-in. choke, T.P. 1,000 lb., C.P. 1,150 lb., gas-oil ratio 510, perf. 6,617-19 ft., T.D. 7,340 ft., P.B. 6,624 ft.

Lovell Lake, Jefferson County: Humble 2-B B. A. Steinhagen, A. O. Donnell Sur., A-115, 131 bbl. through ⅛-in. by 6-in. chokes, T.P. 650 lb., S.I. C.P. 1,500 lb., gas-oil ratio 527, perf. 7,792-97 ft., O.W. D.D., old T.D. 7,785 ft., new T.D. 7,800 ft.

North La Ward, Jackson County: Cities Service Chamrad Unit 4, J. White Sur.,

(Continued on Page 192)

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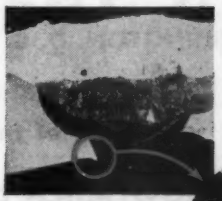
As the science of welding metals progresses, many interesting and unusual problems develop. So that accuracy and thoroughness may be established as fact on jobs of special character, Associated employs full use of scientific checks. The photographed section of pipe shown above is a fabrication made from nickel clad steel. On this particular job the problem was to insure that the deposit of pure nickel in the base of each weld be not less than the thickness of the original clad nickel at all fluid contact surfaces. This work was checked with macrographs as well as photo micrographs.



Magnification 10X

Magnification 100X

Macrograph shows pure deposited nickel at base of weld before any alloying. Photo micrograph in circle shows characteristics of deposited pure nickel, of original clad nickel, of original steel to which nickel was clad.

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Fig. 170
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Fig. 192
1600-lb. Test

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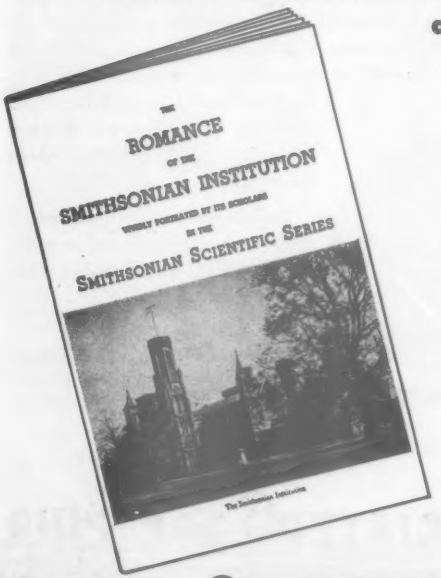

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KANSAS

Northern Ordnance May Have Oil Well in Cowley

DRILLING operations throughout the state were routine over the past week although some 63 wildcats were actively drilling or moving in materials. Completions for the week totaled 22, of which 13 were oil wells and 9 dry holes. There were 47 first reports of new wells last week.

Cowley County. — Northern Ordnance, Inc., had promises of an oil well at its 1 Ramey, NW SW 20-33-8e, in the southeast part of the county and north of the Guthrie gas field. Saturated Lansing-Kansas City lime was found at 2,430-37 ft. It was estimated to be good for 30 bbl. of oil a day but operators were drilling deeper before testing.

Russell County.—Ohio Oil Co. 1 Strecker, S½ SE SW 21-15s-14w, an outpost well from the Trapp pool which has been making production tests for the past few weeks, was drilled out to 3,356 ft., cleaned out and reacidized. In 5 hours, 160 bbl. of oil was swabbed, 1,000 ft. off bottom. Further swabbing tests produced 45 bbl. of oil an hour. The well is now on the pump. The oil is high quality, testing 48 gravity, with no water.

Ellis County.—North and east of the small Madden pool, another discovery was ready to go on the pump. The B. & R. Drilling Co. 1 Leiker, N½ NW NW 14-15-18w, filled up 700 ft. with oil in 40 minutes and swabbed 10 bbl. of oil an hour for 6 hours after perforating in the Lansing lime at 3,294-98 ft.

KANSAS COMPLETIONS

Wildcats

Cowley County: J. J. Lynn 1 Newfield, W½ NW NE 11-34-4e, dry, T.D. 3,124 ft., Lansing 1,840 ft., Layton 2,305 ft., Mississippi lime 3,095 ft.

Greeley County: Helmerich & Payne et al 1 McCormack, NW NE 23-16-40w, dry, T.D. 5,785 ft., Topeka 4,010 ft., Lansing 4,457 ft., Mississippi lime 5,140 ft., Viola 5,649 ft., Arbuckle 5,714 ft., porosity 5,770-80 ft., but no shows.

Phillips County, Hansen pool: Cities Service 1 Templeton, SW SE SW 14-5-20w, pumped 383 bbl., Arbuckle 3,530-50 ft., 3,592-3,601 ft., T.D. 3,780 ft., new pay zone for Hansen pool.

Pratt County: Champlin Ref. 1 Allen, SW SW SW 15-27-12w, dry, T.D. 4,533 ft., Lansing 3,643 ft., Viola 4,293 ft., Simpson shale 4,350 ft., sand 4,358 ft., Arbuckle 4,472 ft.

Reno County: Lauck-Moncrief 1 Witt, SE SE SE 12-25-8w, dry, T.D. 4,290 ft., Lansing 3,210 ft., Mississippi lime 3,802 ft., Viola 4,163 ft., Simpson 4,177 ft., Arbuckle 4,264 ft.

Russell County: The Texas Co. 1 Jellison, NE NE SE 13-13-15w, dry, T.D. 3,253 ft., Lansing 2,970 ft., Arbuckle 3,244 ft.

Kingwood Oil et al 1 Bouska, NW NW NE 14-15-11w, dry, T.D. 3,392 ft., Lansing 2,990 ft., sand 3,323 ft., Arbuckle 3,358 ft.

Fields

Carmi, Pratt County: Shell 2 Stueder, SW NE SE 29-26-12w, flowed 75 bbl. an hr., Arbuckle 4,258-4,310 ft.

Drach, Stafford County: Atlantic Ref. 5 Alpers, NW SE 7-22-12w, swabbed 4 bbl. an hr. before acid., Arbuckle 3,688-90 ft., potential 1,904 bbl.

Eldorado, Butler County: Adair-Norton and Phil-Han 2 Robison, NE NE SE 18-25-5e, pumped 50 bbl., Mississippi lime 2,585-96 ft.

Hall-Gurney, Russell County: Phil-Han Oil 9 Letsch, NE SW NE 34-14-13w, pumped 130 bbl., Lansing 2,853-63 ft.

Texas 3-B Boxberger, NW NE 22-14-14w, pumped 174 bbl., Lansing 3,018-79 ft.

Kraft-Prusa, Barton County: Gulf 3 Staudinger, SE SE SW 7-16-11w, pumped 48 bbl., Arbuckle 3,312-18 ft.

R. E. Day 3 Dolechek, N½ SW SW 13-16-12w, potential 3,000 bbl., conglomerate 3,323-39 ft.

Krug, Russell County: National Ref. 1 Krug, NE NW SE 8-14-14w, pumped 346 bbl., Lansing 3,061-66 ft.

Lindsborg, McPherson County: Texas Co. 1 Helander, W½ SW NE 36-17-4w, pumped 162 bbl., Viola 3,382-95 ft., T.D. 3,531 ft.

Dickey Oil Co. 1-B Frantz, W½ SE NE 24-17-4w, pumped 800 bbl., Viola 3,413-18 ft.

Lost Springs, Marion: Bob Youker 3 McNicol, W½ NW NW 3-17-4e, dry, T.D. 2,376 ft., Mississippi lime 2,323 ft.

Lost Springs, Marion County: A.M.F.A. Oil Co. 2 Dunlap, W½ NW SE 23-17-4e, dry, T.D. 2,392 ft.

Spangenberg, Stafford County: Stanolind 1 Ukens, N½ SE NE 21-22-12w, dry, T.D. 3,707 ft., Arbuckle 3,695 ft.

Trapp, Russell County: Carolena Oil 2 Gale Sellens, SW SE NW 19-15-13w, pumped 218 bbl., Arbuckle 3,300-13 ft.

Derby Oil and Crow Drlg. 2 Maier, SE SE SE 10-15-14w, pumped 77 bbl., Arbuckle 3,218-28 ft.

Van Lieu, Stafford County: Stanolind and Derby 1 Beckerdite, NE SW NW 21-24-13w, swabbed 22 bbl. an hr., Arbcukle 4,057-67 ft.

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ILLINOIS FIELD REPORT

Important Wildcat Production in Clay, Wayne and White Counties

MATTOON, Ill.—One of the best wells completed in the state in recent times is L. L. Waggoner et al 1 Pilcher, C SW NW 13-5n-5e, which has either extended the Iola pool in Clay County or opened a new pool. The well had been tested for 3 weeks before completion and consistently flowed or pumped over 500 bbl. and on some days over 800 bbl. per day from McClosky lime. The well has been acidized.

The Clay City pool in Wayne County was extended southwesterly by Pure Oil Co. 2 T. R. Michaels-A, SE SE NW 34-2n-7e. A strong flow of oil from McClosky lime at 3,043-53 ft. was ignited by the exhaust from a cement truck, but the flame was extinguished after it had burned 2 days. The well then flowed over 2,100 bbl. of oil into pits in 24 hours. It was not yet completed.

Twenty-seven new operations were started during the week including eight wildcats: Kirkpatrick 1 Williamson, NE SE NW 20-5n-5e, Clay County; Herndon Drilling 1 D. Busler, NW NE NW 28-7s-6e, Saline County; Magnolia 1 Newell-Blodgett, SW NE NE 18-3s-3e, Jefferson County; Bergunthal 1 Sloan, NE NW SW 12-3n-1e, Marion County; C. Robinson 1 E. Barnick, C NE NW 36-6n-6e, Effingham County; Ohio 25 J. Conrad, 678 ft. from north and 670 ft. from east lines SW SW 15-5n-11w, Crawford County; Anthony F. Keating 1 Uphoff, SE NW NW 25-12n-7e, Coles County; E. P. Corley 1 Pemberton, NE SW SW 28-5n-5e, Clay County.

Two miles northwest of the New Harmony pool Lewis Production and Whisenant 1 E. E. Owen, SW NW NW 18-4s-14w, White County, tested oil and gas in Aux Vases sand at 2,807-53 ft.

T. T. Eason & Co. found a favorable showing of oil in Devonian lime in 1 Louis Mayer, SE NW SW 15-4n-6w, in Madison County, but was drilling in Trenton lime when last heard from. The Devonian was tested at 1,765-96 ft. the recovery being 33 ft. of oil, 90 ft. of oil-cut mud and 120 ft. of mud in 1 hour. A test at 1,794-1,813 ft. developed 30 ft. of oil and 100 ft. of oil-cut mud and 20 ft. of sulfur water. The same operators, in their 1 Clark, C SE NW NW 30-4s-11e, in White County, found pay in the Pennsylvanian sand in the Phillipstown pool, and casing was set at 1,334 ft. for a production test.

ILLINOIS COMPLETIONS

Wildcats

Clay County: L. L. Waggoner et al 1 John Pilcher, C SW NW 13-5n-5e, pumped 699 bbl. in 24 hr. from McClosky lime at 2,452-57 ft., acidized, T.D. 2,466 ft., new pool or an extenion to Iola pool.

Fayette County: B. M. Heath et al 1 J. F. Millan, C SE SW 22-6n-3e, dry at 2,149 ft., Menard 1,420 ft., upper Glen Dean 1,603 ft., Golconda 1,651 ft., Barlow 1,722 ft., Cypress 1,743 ft., Weiler 1,768 ft., Benoist 1,933 ft., Renault 1,972 ft., Aux Vases sand broken, Ste. Genevieve 2,039 ft., Rosiclare 2,051 ft., Fredonia 2,079 ft., McClosky 2,090-94 ft. and 2,124-31 ft., St. Louis 3,138 ft.

Hamilton County: J. P. Washburn 1 C. Arnold, NW NE SE 17-6s-7e, east of the Dale-Hoodville pool, dry at 3,341 ft., Tar Springs 2,426 ft., upper Glen Dean 2,489 ft., lower Glen Dean 2,514 ft., Hardinsburg 2,561 ft., Golconda 2,620 ft., Barlow 2,754 ft., Cypress 2,775 ft., Weiler 2,810 ft., Paint Creek lime 2,947 ft., Paint Creek sand 2,972 ft., Benoist 3,026 ft., Renault 3,066 ft., Aux Vases 3,075 ft., Ste. Genevieve 3,147 ft., Rosiclare 3,163 ft., Fredonia 3,234 ft., McClosky 3,254-59 and 3,298-3,301 ft.

Sam Yingling 1 Malone heirs, SW SE NW 11-5s-6e, dry at 3,542 ft., Menard 2,514 ft., lower Menard 2,585 ft., no Tar Springs, upper Glen Dean 2,730 ft., lower Glen Dean 2,776 ft., Golconda 2,890 ft., Barlow 3,012 ft., Cypress 3,072 ft., Paint Creek lime 3,195 ft., Benoist 3,234 ft., Renault 3,295 ft., Aux Vases 3,333 ft., Ste. Genevieve 3,372 ft., Rosiclare 3,420 ft., Fredonia 3,477 ft., McClosky 3,478-88 ft.

Monroe County: Vawter & Braun 1 Dill, SE NE NW 13-3s-10w, dry at 965 ft.

Montgomery County: W. Ralph Holmes 1 Sewing, NW SE SW 28-8n-5w, dry at 699 ft., Pottsville at 565 ft., no showing.

White County: A. H. Anderson 1 White County Farm, SE NE SW 7-5s-10e, dry at 3,210 ft., Tar Springs 2,542 ft., upper Glen Dean 2,608 ft., Golconda 2,687 ft., Barlow 2,810 ft., Cypress sand 2,836 ft., Paint Creek lime 2,950 ft., lower Renault 3,088 ft., Aux Vases 3,110 ft., Ste. Genevieve 3,134 ft., Rosiclare 3,155 ft., Fredonia 3,165 ft.

Washington County: Texas 1 C. L. Kokesh, SW SW SE 32-2s-4w, dry at 2,495 ft.

Williamson County: Nash Redwine 1 Old Ben Coal Co., SW NE SW 6-8s-3e, dry at 3,002 ft., P.B. to 2,700 ft. and tested at 2,665-2,700 ft., recovered salt water and no oil.

Fields

Clay City, Wayne County: Pure 2 S. B. Garrison-B, SE NE SW 35-2n-7e, pumped 14 bbl., Aux Vases sand 2,947-65 ft., shot, T.D. 2,970 ft.

Covington, Wayne County: Deep Rock 3 J. E. Stroup, C NE SW 29-1s-7e, pumped 190 bbl. in 19 hr. and 179 bbl. next 24 hr., Levias lime 3,188-95 ft., acid., T.D. 3,196 ft.

Geff, Wayne County: Pure 1 Leroy Pike, NE NW NE 14-1s-7e, pumped 144 bbl. oil, 14 bbl. water, McClosky lime 3,224-26 ft., acid., T.D. 3,226 ft.

Iola, Clay County: Luttrell et al 10 Reed heirs, SW SW NW 14-5n-5e, pumped 228 bbl., Cypress 2,122-37 ft., Benoist 2,281-2,301 ft., Aux Vases top 2,324 ft., shot at 2,291-2,307 ft., T.D. 2,355 ft.

Keensburg, Wabash County: Continental 1 L. Williams, SW NE NE 17-2s-13w, old well deepened from 2,409 to 2,564 ft. and shot at 2,535-63 ft., Benoist sand, pumped 37 bbl. oil, 7 bbl. water.

Maud, Wabash County: C. E. Skiles 2 Murray-Burkett, NE SE SE 34-1n-13w, dry at 2,694 ft., Glen Dean 2,068 ft., Hardinsburg 2,121 ft., Golconda 2,189 ft., Barlow 2,275 ft., Cypress 2,305 ft., Benoist 2,437 ft., Ste. Genevieve 2,596 ft., no McClosky, P.B. and shot at 1,738-50 ft. and 1,805-16 ft., then drilled to 2,694 ft.

Phillipstown, White County: Sun 1 S. B. Renshaw, SE NE SE 1-5s-10e, pumped 23 bbl. oil and 30 bbl. water, Tar Springs sand 2,260-70 ft. and 2,304-15 ft., shot at 2,305-15 ft., T.D.

Rural Hill, Hamilton County: Texas 2 V. Johnson, SE SW NW 18-6s-6e, pumped 69 bbl. oil, 10 bbl. water, Aux Vases sand 3,039-61 ft., shot, T.D. 3,063 ft.

St. James, Fayette County: Texas 4 R. W. Prather, SE SE NE 34-6n-3e, pumped 80 bbl., Rosiclare lime 2,402-08 ft., shot at 2,401-11 ft., T.D.

Sailor Springs, Clay County: Gulf 4 Richard Keck, NE NW SE 26-4n-7e, pumped 28 bbl. oil, 5 bbl. water, Tar Springs sand 2,232-35 ft., shot, T.D. 2,340 ft.

Sims, Wayne County: Texas 1 Lawrence-Malone Community, C W½ NW SE 27-1s-6e, pumped 25 bbl. oil, 3 bbl. water, McClosky lime at 3,194-3,200 ft., acid., T.D. 3,201 ft.

South Lawrence, Lawrence County: Dee Bros. et al 1 Mitchell-Lewis, SE SE NE 27-2n-12w, pumped 40 bbl., Biehl sand 1,372-93 ft., shot, T.D. 1,403 ft., P.B. to 1,392 ft.

South Mason, Effingham County: Kingwood 3 See estate, NE SW SE 27-6n-5e, pumped 102 bbl. oil, 32 bbl. water, Benoist sand 2,288-2,310 ft., saturated, Aux Vases sand 2,353-70 ft., shot at 2,302-07 ft. and 2,671-70 ft., T.D.

Walpole, Hamilton County: Texas 5 R. Hall, SE SE NE 28-6s-6e, pumped 15 bbl. oil, 14 bbl. water, Tar Springs sand 2,474-95 ft., T.D. 3,137 ft., P.B. to 2,935 ft., tested through perforations at 2,882-88 ft., set plug at 2,530 ft. and tested through perf. at 2,472-82 ft.

Oil Carriers 2 O. Irwin, NW NE NE 35-6s-6e, pumped 95 bbl. oil, 9 bbl. water, Aux Vases 3,088-3,105 ft., shot, T.D. 3,116 ft.

West Mount Carmel, Wabash County: C. V. Bay 2 Hockgeiger-A, SW NW SE 14-1s-13w, dry at 2,629 ft., Benoist 2,326 ft., Renault 2,438 ft., Levias 2,496 ft., Fredonia 2,531 ft., McClosky 2,551-57 ft.

Permian Basin, Panhandle

(Continued from Page 163)

County wildcat, had progressed to 3,930 ft.

TEXAS PANHANDLE COMPLETIONS

Gray County: Rudco Oil 1 Bass-Clay, 660 ft. from N and E, 40-ac. tract, Sec. 177, Blk. B-2, H.&G.N.R.R. Sur., elev. 3,314 ft., pump 65 bbl., pay 2,982 ft., T.D. 3,021 ft.

Hutchinson County: Continental 7-D J. M. Sanford, 985 ft. from S, 330 ft. from W, Sec. 76, Blk. 46, H.&T.C.R.R. Sur., elev. 2,959 ft., pump 162 bbl., pay 2,822 ft., T.D. 2,884 ft.

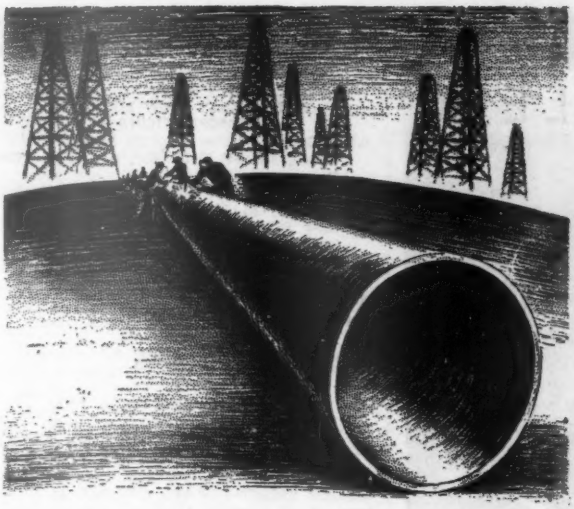
Gulf 112 C. L. Dial et al, 2,146 ft. from E, 2,014 ft. from S, Sec. 90, Blk. Z, G.C.&S.F.R.R. Sur., elev. 3,082 ft., pump 54 bbl., pay 2,946 ft., T.D. 3,094 ft.

J. M. Huber Corp. 4 Mayfield, 330 ft. from W, 2,970 ft. from S, Sec. 4, Blk. R-2, D.&P.R.R. Sur., elev. 3,353 ft., pump 164 bbl., pay 3,256 ft., T.D. 3,261 ft.

Shamrock Oil & Gas 6 Stewart, Sec. 19, Blk. M-16, A.B.&M. Sur., dry, T.D. 3,100 ft.

Shamrock Oil & Gas 7 Stewart, 1,980 ft. from S, 660 ft. from W, Sec. 19, Blk. M-16, A.B.&M. Sur., elev. 3,327 ft., pump 62 bbl., pay 3,131-38 ft., P.B. to 3,143 ft. from T.D. 3,203 ft.

Skelly 10-A Herring, 3,646 ft. from N,



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1,342 ft. from W of lease, E. Almaguel Sur., elev. 3,193 ft., pump 150 bbl., lime and dolomite pay 3,077-84 ft., T.D. 3,095 ft.

SOUTHEAST NEW MEXICO COMPLETIONS

Eddy County: Yates, Martin & Nix 1 Matthews, NE SE 21-21s-28e, dry, T.D. 2,820 ft.

South Eunice, Lea County: Texas Pacific Coal & Oil 28 State, NE SE 5-22s-36e, flow 432 bbl., pay lime 3,850 ft., acid. 2,000 gal., T.D. 3,885 ft.

The Derivation of Reservoir Rocks

(Continued from Page 160)

terial is removed, at least from the upper part. It is thus left essentially in the same general location as it occupied before the sea covered it. It is generally agreed that all conglomerate are basal conglomerates; that is, they were formed by the sea advancing over a pebble and sand-strewn land mass. Just where the boundary line comes between deposits of this type and clastics deposited in the sea is not known. Many sand bodies lie on unconformable surfaces but the sand could be transported and strewn over these surfaces or it could be spread over them by an advancing sea with little transportation. In both cases the sand would not necessarily have any relation to the rocks on which it lies. Fortunately, the problem is not of great practical importance as it involves the amount of transportation rather than deposition which is the same in both cases. The reservoirs formed by deposits of this type are of two main classes, recognizable **basal sands**, such as the Sooy of Kansas, and including granite wash, such as is found in the Texas Panhandle and **blanket sands** not unconformable with overlying deposits. Accumulation in the latter is almost always structural, as in the case of the Wilcox of the Seminole area in Oklahoma or the Woodbine in Van, Mexia and other similar accumulations in Texas.

Sandstones of the normal or quartzose type, therefore, give rise to the following kinds of oil reservoirs:

1. Truncated sands below an unconformity.
2. Buried river beds.
3. Shore-line deposits.
   (a) Near-shore sand bodies.
   (b) Buried sand bars.
4. Blanket sands.
   (a) Basal sands.
   (b) Blanket sands with structural closure.

Chemistry of Decomposition of Sandstones

As has been pointed out above, a conglomerate is composed of pebbles of many kinds of rock, and the chemistry of the decomposition of these pebbles is, therefore, complex. Sandstones of the normal type consist

mainly of quartz with cementing material and some impurities, such as grains of dolomite and of stable minerals derived originally from igneous rocks. These include such accessory minerals as rutile (or the other TiO_2 minerals, brookite and anatase), garnet, kyanite, magnetite, titanite, spinel, topaz, tourmaline and zircon. Of these, the minor accessory minerals are very stable, dolomite and quartz are quite stable but do go into solution to some extent. According to Clarke, 11.67 per cent of the inorganic matter in solution in river water is SiO_2 and since the average river carries from 100 to 250 p.p.m. of solids in solution, this amounts to from 12 to 30 p.p.m. of silica. The only substances in greater concentration are carbonate, sulfate and calcium. It is probable that the greater part of this dissolved silica does not come from sand but from silicates, mainly alkaline, which have been attacked by weathering.

The cementing material in sandstones consists mainly of calcite which goes directly into solution under slightly acid conditions prevailing near the earth's surface. Silica itself is probably the next most common cementing material and, as has already been pointed out, this material is relatively insoluble. Hydroxides of iron and aluminum form ferruginous and argillaceous cements. The former are slightly soluble but both cementing materials are probably removed more easily by mechanical than chemical means. Aiding in the breakdown of these cements is an admixture of carbonates which are leached out.

The products of decomposition of sandstones which are added to the stream of decomposition products from other rocks thus include mainly silica, calcium, magnesium, carbonate and a little iron.

Oklahoma Fields

(Continued from Page 164)

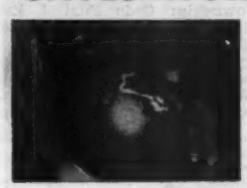
7-3s-5w, pumped 21 bbl., T.D. 1,165 ft.
Jackson Bros. 2-A Dilley-C, NW NE NE 7-3s-5w, flowed 25 bbl., T.D. 1,096 ft.

Miscellaneous

Creek County: Bruin Oil 3 Cruce, SW SE NE 28-14n-10e, pumped 60 bbl., Wilcox 3,251-88 ft.
T. C. Greer 1-B Dressler, SW NW SW 15-17-8e, dry, T.D. 1,730 ft.
Gulf 41 Pitman, N½ SE SE 7-17n-12e, pumped 15 bbl., T.D. 1,562 ft.
Sinclair Prairie 13 Wacoche, SE NW SE 20-18n-7e, pumped 11 bbl., T.D. 2,633 ft.
Gulf 42 Pitman, SW NW SW 8-17n-12e, input well, T.D. 1,566 ft.
Okfuskee County: Northern Ordnance 1 Blumenthal, NE SW 7-13n-7e, 12,000,000 cu. ft. gas, Hunton 4,009-26 ft., T.D. 4,214 ft., R.P. 1,200 lb.
Osage County: Ben Blubaugh No. 1, NW NW NW 8-28n-12e, dry, T.D. 1,025 ft.
Oklahoma Natural Gas No. 2144, SE SW NE 28-20n-12e, input well, T.D. 1,606 ft.
Neal et al No. 2, SE NE NW 11-21n-8e, pumped 12 bbl., T.D. 1,693 ft.
Seminole County: Wood Oil 1-B Shaw, NW SE SE 28-9n-6e, pumped 50 bbl., Calvin 2,548-58 ft., T.D. 4,152 ft.
Harry Diamond 1 Powell, SW NE SE 10-6n-5e, dry, T.D. 3,200 ft., Cromwell 3,200 ft.

STRAUSS

PROTECTOR HELMET SAVES WORKER'S LIFE



A worker's life was spared today when a steel clip plummeted 30 feet and struck the helmet he was wearing. The illustration shows the clip and the Strauss helmet that absorbed the force of the blow. The uninjured worker immediately after the near-tragedy hurried to the safety office to secure a new protective chapeau.

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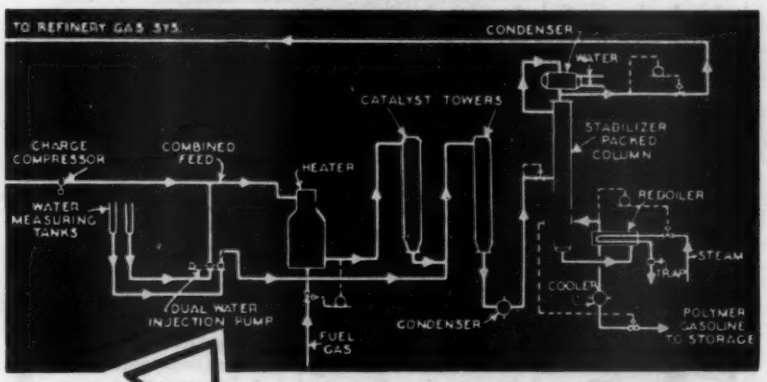

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These pumps accurately measure and inject small quantities of water under high pressure into the feed stream ahead of the catalyst towers to control moisture content.

Universal Oil Products Company engineers approve these pumps for the difficult service mentioned.

You, too, will benefit by Hills-McCanna pumping accuracy and dependability. If you have a precision pumping problem let us work with you towards its solution.

HILLS-McCANNA COMPANY
2351 Nelson St., Chicago

Above photo shows one of the 55 "U" type pumps used. Such pumps are capable of pumping 31.2 g.p.h. against 100 p.s.i. and for smaller capacities as high as 4000 p.s.i.

HILLS-McCANNA
Positive PROPORTIONING PUMPS
WITH POSITIVE ACTING CHECK VALVES

OHIO, KENTUCKY

Show Being Tested Northeast Of Clayton Pool

ZANESVILLE, Ohio.—The Atha Co. has drilled in and is testing a well on the George Mavromatis tract that is making a good showing of oil. The well is in Section 15, Madison Township, Perry County, and 4 miles northeast of the Clayton pool.

The Hinckley pool in Medina County was extended 1 mile to the northeast by the J. C. Steiner completion on the Great Lakes Insurance Co., Lot 7, Richfield Township, Summit County.

OHIO COMPLETIONS

Ashland County, Vermillion Township: Ohio Fuel 2 D. R. Harlan, Sec. 30, Clinton, 1,520,000 cu. ft., T.D. 2,639 ft.

Athens County, Carthage Township: Westova Oil & Gas Co. 2 S. J. Barnhill, Sec. 32, Berea, 800,000 cu. ft. and 3 bbl., T.D. 1,702 ft.

Lodi Township: H. B. Walker 2 Eva Parker, Sec. 3, Macksburg 800 ft., 650,000 cu. ft., T.D. 1,085 ft.

Guernsey County, Richland Township: R. M. Burns 9 M. W. C. D., Lot 18, Berea, 3 bbl., T.D. 1,315 ft.

Wheeling Township: Ohio Fuel 1 Eva Crouse, Sec. 16, Oriskany, 2,470,000 cu. ft., T.D. 3,322 ft.

Holmes County, Killbuck Township: Kemrow 1 John C. Lisle, Sec. 1, Clinton, dry, T.D. 3,233 ft.

Licking County, Mary Ann Township: Lacknette 2 C. D. Parker, Sec. 4, Clinton, dry, T.D. 2,701 ft.

Morgan County, Marion Township: Ohio Fuel 1 Wayne Adrian, Sec. 34, Macksburg stray, 579,000 cu. ft., T.D. 862 ft.

C. P. Bowman 22 W. O. Shook, Sec. 7, Cow Run, 1 bbl., T.D. 496 ft.

York Township: Pure Oil 11 A. E. Hughes, Sec. 33, Clinton, dry, T.D. 4,142 ft.

Noble County, Enoch Township: W. T. Warren 4 W. D. Harper, Sec. 29, Gordon, dry, T.D. 2,155 ft. (drilled deeper).

Noble Township: Fassett Oil 13 John Hayes, Sec. 34, Stray, 20 bbl., T.D. 222 ft.

Perry County, Monroe Township: Churry et al 3 Chas. Weaver, Sec. 15, Berea, 1 bbl., T.D. 1,178 ft.

Marshall et al 37 M. H. Donahue, Sec. 4, Berea, dry, T.D. 1,156 ft.

Summit County, Richfield Township: J. C. Steiner 1 Great Lakes Ins. Co., Lot 7, Clinton, 828,000 cu. ft., T.D. 3,618 ft.

Wayne County, Plain Township: D. Shafer 2 Lane Harpster, Sec. 15, Clinton, dry, T.D. 3,362 ft.

WESTERN KENTUCKY

OWENSBORO, Ky.—In Henderson County, Carter Oil 1 C. E. Cottingham, 8 miles south of Henderson, appears to have opened a pool in Waltersburg sand at 1,797-1,806 ft. A 2-hour drill-stem test developed 1,067 ft. of clean oil and 92 ft. of drilling mud. This wildcat is 3 miles from any production.

In Union County, H. H. Weinert 1 Greenwell, a wildcat 1½ miles north of Morganfield, flowed 320 bbl. of oil in 8 hours from acidized McClosky lime at 2,581-93 ft. It was not yet completed.

Henderson County, Reed area: J. H. Snider 1 Heppeler, a wildcat, 2½ mi. N of Reed, dry at 1,925 ft.

Gulf 9 T. T. Williams, Smith Mills pool, pumped 86 bbl. oil and 130 bbl. water, McClosky lime 2,636-55 ft. and 2,699-2,718 ft., T.D. 2,740 ft.

Ashland 1 Galloway, dry at 2,800 ft.

J. H. Snider 2 Otto Chase, Reed area, pumped 25 bbl. from McClosky lime at 1,970-78 ft., acid, T.D. 1,995 ft.

Union County: Pure 1 J. E. Duncan, 5 mi. W of Morganfield, pumped 38 bbl. from Pennsylvanian sand at 1,428-45 ft., T.D. 1,447 ft.

EASTERN KENTUCKY COMPLETIONS

Magoffin County: A. E. Hoenig 13 Paris Long, Litteral Fork, 3 bbl. at 952 ft.

Inland Gas Corp. 245 J. H. Hammons, Grassy Creek of Licking River, Big lime, 442,000 cu. ft. at 1,664 ft.

Knott County: Kentucky-West Virginia Gas Co. 714 Sherwood Osborne, Right Beaver Creek, 133,000 cu. ft. of gas, shale at 3,308 ft.

Kentucky-West Virginia Gas Co. 5439 William Casebolt, Balls Fork, 319,000 cu. ft. gas, shale at 2,965 ft.

Inland Gas Corp. 241 Duke & Smith, Left Fork of Troublesome Creek, dry.

Floyd County: Kentucky-West Virginia Gas Co. 5441 Nimrod Akers, Mud Creek, 158,000 cu. ft. gas, shale at 3,109 ft.

Johnson County: Meade et al 1 Dan Hitchcock, Barnetts Creek, Bix Six, 500,000 cu. ft. gas.

INDIANA COMPLETIONS

Gibson County: Chester Oil 2 G. and M. Schultz, SE SW SW 16-1s-9w, pumped 9 bbl. oil, 1 bbl. water, Hardinsburg sand 1,295-99 ft.

R. D. Brown 3 Clem Lehman, SE NE NW 36-1s-10w, pumped 22 bbl., Hardinsburg sand 1,369-1,400 ft.

Posey County: Felix Jablonski, 2 Renwick Properties, SE SW SW 1-7s-12w, dry at 1,928 ft., Vienna lime 1,896-1,906 ft.

Spencer County: Kraus & Michel 1 J. K. Carey, SE SE 7-6s-3w, dry at 650 ft.

POST-WAR SPECIFICATIONS WILL INCLUDE *Naylor*

Naylor Pipe with its exclusive Lockseam Spiralweld has what it takes to do the job that will be required when peace comes. Its ability to deliver heavy duty performance with a light-weight structure makes it ideal for tomorrow's stepped-up needs.

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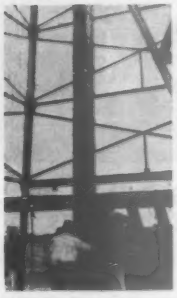

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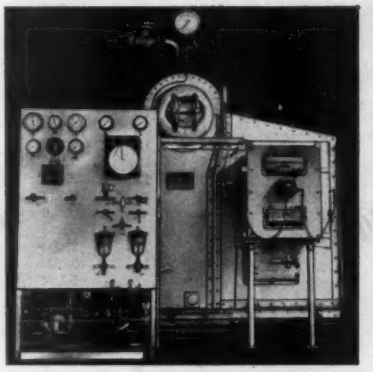

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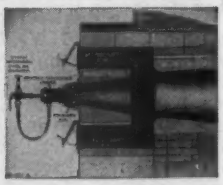

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Rigs and Drilling Wells Increase in May

THE number of wells drilled in May was only 7 under the April figure but the number of oil wells dropped 47. There were nine more gas wells completed in May and the balance were dry holes. Both the April and May figures cover 4-week periods, indicating a leveling off in the drilling slump but reflecting a possible lack of favorable locations in which to drill. Active rigs and drilling wells were up 109 over April, 41 of which was in the Appalachian area and the balance accounted for in small gains in a number of states.

For the third consecutive month, wells in the 5,000-10,000-ft. class have shown an increase. Total completions for May 1942 were 1,421, of which 846 were oil wells. Total completions this year are down 4.4 per cent and oil wells are off 14.9 per cent. The number of wells drilling at the present is the highest since March of last year. In May 1942, the number was 2,339 for all areas. An unknown number of rigs and drilling wells are inactive.

SUMMARY OF OPERATIONS, MAY 1943

	Comp.	Oil	Prod.	Gas	Dry	Under 1,000 ft.	1,000-2,500 ft.	2,500-5,000 ft.	5,000-10,000 ft.	Over 10,000 ft.	Footage	Rigs and drilling
Appalachian	247	160	329	59	28	2	200	31	14	0	497,952	321
Ohio	74	10	584	36	28	13	17	43	1	0	194,921	189
Indiana	16	6	481	1	9	5	9	2	0	0	25,368	21
Kentucky	28	9	1,001	11	8	1	19	8	0	0	60,611	128
Michigan	33	13	8,194	1	19	0	12	21	0	0	96,155	105
Illinois	115	70	6,309	1	44	3	32	75	0	0	303,406	138
Kansas	156	78	25,586	1	77	0	15	137	4	0	537,630	206
Nebraska	4	0	0	0	4	0	0	4	0	0	11,100	2
Missouri and Iowa	1	0	0	0	1	0	1	0	0	0	1,502	1
Oklahoma	65	28	2,206	5	32	4	10	40	11	0	223,486	247
North Texas	95	35	25,181	0	60	7	36	36	16	0	287,747	84
West Central Texas	37	13	3,485	1	23	8	15	14	0	0	80,903	65
West Texas	71	54	39,706	0	17	2	10	37	21	1	317,384	186
Texas Panhandle	18	13	1,979	2	3	0	1	17	0	0	53,322	27
East Texas	26	13	2,698	1	12	0	0	7	19	0	121,030	8
Upper Gulf Coast	40	15	3,128	2	23	0	0	4	36	0	312,102	82
Lower Gulf Coast	35	17	2,036	3	15	0	0	4	30	1	222,233	71
South Central Texas	2	0	0	0	2	1	0	1	0	0	3,617	12
South Texas	25	8	915	0	17	0	3	15	7	0	101,202	59
Southeast New Mexico	26	13	2,698	1	12	0	0	7	19	0	121,030	32
Arkansas	24	16	2,182	1	7	0	2	15	7	0	103,775	49
North Louisiana	28	7	1,122	6	15	0	10	7	11	0	111,577	59
Louisiana Gulf	35	23	4,695	0	12	0	1	0	16	18	329,173	90
Mississippi	1	0	0	0	1	0	0	0	0	1	10,502	19
Montana	23	14	934	3	6	1	13	9	0	0	47,648	74
Wyoming	12	11	4,393	0	1	1	0	8	3	0	50,439	71
Colorado, Utah	0	0	0	0	0	0	0	0	0	0	0	18
Northwest New Mexico	2	1	83	1	0	0	1	0	1	0	7,905	13
California	119	93	14,130	3	23	9	37	52	20	1	398,668	141
Florida	0	0	0	0	0	0	0	0	0	0	0	2
Alabama	0	0	0	0	0	0	0	0	0	0	0	2
Total May	1,358	720	154,115	139	499	57	449	594	236	22	4,632,388	2,522
Total April	1,351	767	120,277	130	454	51	522	559	206	13	4,289,098	2,413
Difference	7	47	33,838	9	45	6	73	35	30	9	343,290	109

SOUTHWEST TEXAS

Two Sands Productive in New Goebel Area

CORPUS CHRISTI, Tex. — Possibility of a dual completion of Henderson Coquat 1 W. W. Goebel, discovery well of the new Goebel field in Live Oak County, was seen this week with the definite proving of one sand and testing of an oil show in another. The well, which is 6 miles east of Three Rivers, flowed at the rate of 120 bbl. from perforations at 6,972-82 ft., through ⅞-in. choke. The oil was of 47.5 gravity. A drill-stem test of a sand at 7,082-89 ft. recovered a 2,000-ft. water cushion, 2,500 ft. of 35-gravity oil and 450 ft. of salt water. Total depth of the Goebel well is 7,095 ft. The same operator was drilling at 852 ft. in shale at his 1 M. Coquat, east of the field opener. Smith & Story, who were drilling at 3,640 ft. in shale at their 1 S. S. Dunn, wildcat test 5 miles southeast of Oakville, in Live Oak County, have found oil shows in a series of tests. Continental Oil Co. has started drilling 3 Albert W. West et al, wildcat test a mile southwest of Oakville, in the same county.

Jim Hogg County.—On a 16-hour test Sun 5 Weil Brothers, wildcat test 15 miles south of Hebronville, flowed 3 bbl. of distillate through ⅛-in. choke, with tubing pressure of 1,575 lb., shut-in casing pressure of 1,825 lb., and gas-oil ratio of 135,110. The well has been shut in. Sun has started work on another wildcat, 1-C S. K. East, 4 miles northeast of Randado. Humble Oil & Refining Co. was drilling at 4,848 ft. in sand at its 4-B Mestena Oil & Gas Co., 12 miles south of Hebronville.

Jim Wells County.—A. H. and C. L. Rowan set 5½-in. casing at 3,713 ft. in their wildcat 1 Fred Bagnall, 4 miles northwest of Bentonville. The well, at total depth of 5,613 ft., was waiting on cement. Kilgore developers have derrick up for 2-A Weldon et al, wildcat test 4 miles southwest of the Gallagher field. Humble was at 4,928 ft. in sandy shale at 1 Nina Adams estate, 2 miles northwest of Magnolia City.

Victoria County.—Continental was rigging up for 1 W. C. Maroney, wildcat 2 miles northwest of Bloomington. Bridwell Oil Co. had derrick up for 1 N. M. Stoner, wildcat 4 miles northwest of Bloomington.

Zapata County. — Texas Co. has staked location for 2 B. Hartman, wildcat test 4 miles southwest of the Comitas field. The same company was drilling ahead at two other wildcats, 1 Bert Hartman, 5 miles west of Guerra, and 1 T. Davis, 4 miles south of the Comitas field.

SOUTH TEXAS COMPLETIONS

Wildcats

Duval County: H. J. Porter et al 1 Sadie Hay, 1½ mi. NW of Crestonio, dry at 5,012 ft.

Live Oak County: Moore Development Co. 1-A Clara Briam, Dennis McGowen Sur., A-29, dry at 8,014 ft.

Starr County: Lockhart & Davenport 1 Block Realty Co., 7 mi. N of Rio Grande City, dry at 1,189 ft.

Fields

Aviator, Webb County: S. Robertson 1

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. . . when delivering air or handling gases with STURTEVANT HIGH PRESSURE FANS

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POWER SAVINGS — Whether motor or turbine driven, power requirements vary in proportion to the volume of air or gas handled.

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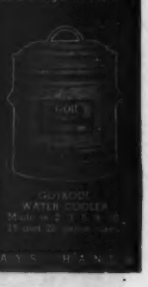

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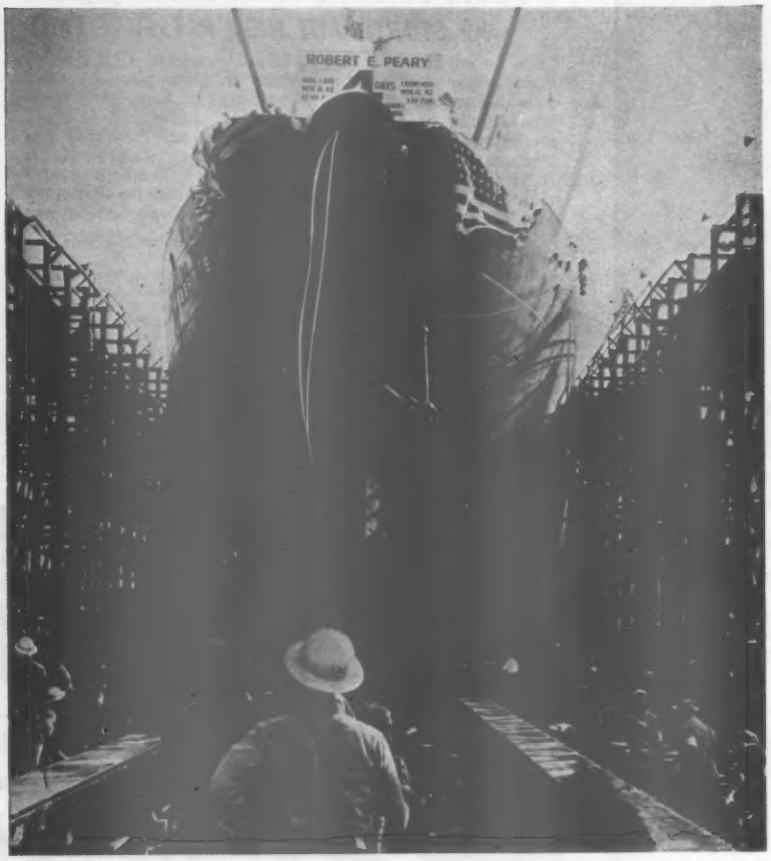

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Puig Bros., Alberca de Arriba grant, A-1996, dry at 1,872 ft.

Dulup Oil Co. 7 Puig Bros., Alberca de Arriba grant, dry at 1,859 ft.

Rincon, Starr County: Highland Oil Co. 1 M. M. Garcia, R. D. Storey Sur. 917, dry at 4,504 ft.

SOUTH CENTRAL TEXAS COMPLETIONS

Wildcats

Guadalupe County: J. H. Eddy and T. D. Bromley 1 John Peters, 7 mi. E of Seguin, dry at 2,766 ft.

Travis County: Marts & Beaven, Inc., 1 W. S. Chamberlain, 1¾ mi. S of Manor, dry at 770 ft.

Marts & Beaven, Inc., 2 E. A. Pearson, 1 mi. N of Elroy, dry at 1,635 ft.

LOWER GULF COAST COMPLETIONS

Wildcats

De Witt County: Pitkin-Goldston Oil Co. 1 H. Mugge, 2½ mi. W of Nordheim, dry at 7,809 ft.

Jim Wells County: Humble 1 M. A. Evetts, 2 mi. N of Magnolia City, 121 bbl. through ½-in. choke, T.P. 60 lb., gas-oil ratio 373, perf. 5,385-5,400 ft., T.D. 5,156 ft., P.B. 5,142 ft. Discovery.

Karnes County: Plymouth 1 G. P. Bridges, 4½ mi. SE of Gillette, dry at 6,290 ft.

Fields

Gallagher, Jim Wells County: M. M. Miller & Sons 2-B Gallagher, dry at 5,170 ft.

Odem, San Patricio County: Seaboard 4 J. Spiekerman, Juan Hart & Son Sur., A-10, 141 bbl. and 6 bbl. salt water through ⅛-in. choke, T.P. 750 lb., gas-oil ratio 326, perf. 5,316-19 ft., T.D. 5,570 ft., P.B. 5,320 ft.

Porter, Karnes County: Transwestern Oil Co. 1 J. Hilbrich, Victor Blanco Sur. (SE offset to 1 Parr-Sellers), dry at 4,858 ft.

Texas Gulf Coast

(Continued from Page 181)

A-82, 41.29 bbl. in 3 hr. through 7/64-in. choke, T.P. 480 lb., C.P. 640 lb., gas-oil ratio 217, perf. 5,214-28 ft., T.D. 5,240 ft.

Sun 1 O. E. Hackbarth, P. Scott Sur., A-69, 25 bbl. through ¼-in. choke, T.P. 50 lb., C.P. 325 lb., gas-oil ratio 400, perf. 5,220-23 ft., T.D. 5,224 ft.

Stowell, Jefferson County: Phillips et al 1 Follmer, E. Lopez Lge., A-37, dual completion; from perf. 7,820-26 ft., 748.85 bbl., 36.5-gravity oil through ¼-in. by 6-in. chokes, T.P. 1,050 lb., gas-oil ratio 574; from perf. 7,558-64 ft. 492.20 bbl., 34.5-gravity oil through ¼-in. by 6-in. chokes, C.P. 720 lb., gas-oil ratio 480, T.D. 7,984 ft., P.B. 7,895 ft.

Sinclair Prairie 1 Bert Ensink, B. A. Vacocu Lge., A-53, dry at 9,100 ft. in sidetracked hole.

Texas 1 Schumucker-Steele, E. Lopez Lge., A-57, 422.42 bbl. through 12/64-in. choke, T.P. 1,200 lb., gas-oil ratio 580, perf. 7,833-43 ft., T.D. 7,845 ft.

Turtle Bay, Chambers County: R. J. Ursillo et al 1-B Tassie Lotz, G. B. Jamison Sur., 99 bbl. through 10/64-in. choke, T.P. 390 lb., S.I. C.P. 1,350 lb., gas-oil ratio 400, perf. 6,560-71 ft., T.D. 6,646 ft., P.B. 6,575 ft.

Louisiana Gulf Coast

(Continued from Page 167)

Pecan Island, Vermilion Parish: Humble 2 Louisiana Furs, Inc., 22-16s-1e, 2,088,000 cu. ft. dry gas through 10/64-in. choke, T.P. 3,000 lb., perf. 7,515-30 ft., T.D. 11,811 ft., P.B. 7,540 ft.

Starks, Calcasieu Parish: W. T. Burton Co. 9 Lutcher-Moore Lumber Co., 17-9s-12w, dry at 9,565 ft.

West Gueydan, Vermilion Parish: Magnolia 2-B H. Reese, 5-12s-2w, O.W.W.O., originally completed dry Sept. 2, 1938, old T.D. 7,644 ft., cleaned hole and sidetracked at 4,130 ft., drilled to 10,869 ft. in sidetracked hole, P.B. 10,817 ft., 260 bbl. through ⅛-in. choke, T.P. 2,000 lb., gas-oil ratio 750, perf. 10,796-10,800 ft.

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NORTH LOUISIANA

Arkansas Completions Increase Over 1942

SHREVEPORT, La.—Drilling in the North Louisiana-Arkansas areas reflected an increase in the completions reported last week. In Louisiana there were eight wells finished, including two oil and two gas and in Arkansas four were oil wells and two dry holes. Arkansas completions are up 55 per cent over 1942, a trend that may reverse the Oil and Gas Commission's recommendation not to increase the allowable over 72,000 bbl. The commission reports, however, that due to low prices stripper wells are being shut down to such an extent as to offset new production.

ARKANSAS COMPLETIONS

Wildcats

Calhoun County: Placid Oil 1 Groth, NE SW 35-14s-15w, dry, T.D. 4,711 ft., Smackover 4,616 ft.

Fields

Fouke, Miller County: Carter Oil Co. 1 Strohacker, SE SW SW 31-16s-26w, pumped 166 bbl., cut 4 per cent, T.D. 3,725 ft.

Hillsboro, Union County: Hunt Oil 2 Burnside, NW SW NW 19-18s-13w, pumped 15 bbl. oil and 435 bbl. water, T.D. 2,278 ft.

Irma, Nevada County: Berry Asphalt 1 D. M. Atkins, SE NW SW 9-14s-21w, dry, T.D. 1,277 ft., Nacatoch 1,250 ft.

Macedonia, Columbia County: Tide Water-Seaboard 1 S. T. Dodson, C N½ SE 20-18s-21w, flowed 142 bbl. in 4 hr. in Cotton Valley at 7,190-7,200 ft., flowed 21 bbl. distillate in 2 hr. in Smackover at 8,873-95 ft., T.D. 8,920 ft.

Stephens, Nevada County, McAlester Fuel 1-A Williams, SW SW SE 2-15s-20w, pumped 140 bbl., perf. 2,502-19 ft., T.D. 2,625 ft.

NORTH LOUISIANA COMPLETIONS

Wildcats

Caldwell Parish: Youngblood & Foree 1 Louisiana Central, SE SE 18-14n-3e, dry, T.D. 6,500 ft.

Red River Parish: Cryer & Reese 1 Bamburg, SE NE 27-12n-9w, dry, T.D. 1,992 ft., Nacatoch 1,346 ft., Saratoga 1,462 ft., Buckrange 1,973 ft.

Fields

Caddo, Caddo Parish: Texas Co. 59 S. P. Harrell, NE NW SW 4-21n-16w, flowed 7½ bbl. oil and 200 bbl. water, T.D. 2,604 ft.

Catahoula Lake, La Salle Parish: Harry Shulman 5 Shapire, 39-7n-3e, flowed 5 bbl. an hr., perf. 3,954-59 ft., T.D. 4,265 ft.

Hosston, N., Caddo Parish: H. C. Owens 1 Hall Dominick, NE SE 7-22n-14w, dry, T.D. 6,010 ft.

Little Creek, La Salle Parish: F. O. Roshko 1 Russell, NW NE 36-9n-1e, dry, T.D. 2,500 ft.

Monroe, Morehouse Parish: Union Producing Co. 63 Crossett Lumber, NE NW NE 11-21n-4e, 992,000 cu. ft. gas, open flow, T.D. 2,212 ft.

Sugar Creek, Claiborne Parish: Hassie Hunt 3 Byrd, NE NW 17-19n-5w, dry, T.D. 6,210 ft.

MISSISSIPPI

JACKSON, Miss.—California Co. 1 G. T. Smith, Lincoln County wildcat in 4-7n-7e, flowed 25 bbl. of oil through the 2½-in. tubing in 24 hours from perforations at 10,156-75 ft. Total depth is 12,229 ft., plugged back to 10,461 ft. California Co. 1 Natural Gasoline Co. of Louisiana, Inc., 52-7n-1w, Adams County, was drilling at 3,583 ft. in sand and shale. It found the base of the Vicksburg at 1,882 ft. It topped the Moody's Branch at 2,315 ft., Cockfield 2,345 ft., Sparta lime 2,950 ft., and Sparta sand 3,030 ft. Gulf Refining Co. has staked location for a wildcat test, 1-A School Land, in 16-3n-7w, Greene County. Gulf abandoned its location for 1 Mark Wolff, 17-3n-7w, Greene County.

MISSISSIPPI COMPLETIONS

Wildcats

Copiah County: Freeport Sulphur Co. 1 Cecil Bell, SW NE NE 29-10n-9e, dry, T.D. 2,262 ft.

Carter Oil 1 School Land, SE SE 16-11n-5e, dry, T.D. 10,502 ft., previously reported in Madison County.

Madison County: Roeser & Pendleton 1 N. V. Boddie, NW SW 18-7n-1e, dry, T.D. 3,939 ft., Wilcox 1,940 ft., Midway 3,605 ft., gas rock 3,690 ft.

Stone County: Richard W. Norton, Jr., 3 L. N. Dantzler, SW SW 10-4s-10w, dry, T.D. 8,352 ft.

Fields

Pickens-Vaughn, Madison County: Carter Oil 1 J. Massey, SE NW 10-11n-3e, flowed 630 bbl. oil and 49 bbl. wash water in 13 hr., T.D. 4,851 ft.

Phillips Pet. 2 Gene, SE SE 4-11n-3e, flowed 163 bbl. in 12 hr., sand 4,831-56 ft., T.D. 4,910 ft.

Pickens-Vaughn, Yazoo County: Tip Ray et al 1 Wilson, SW NW SE 30-12n-3e, pumped 200 bbl. oil, T.D. 4,885 ft.

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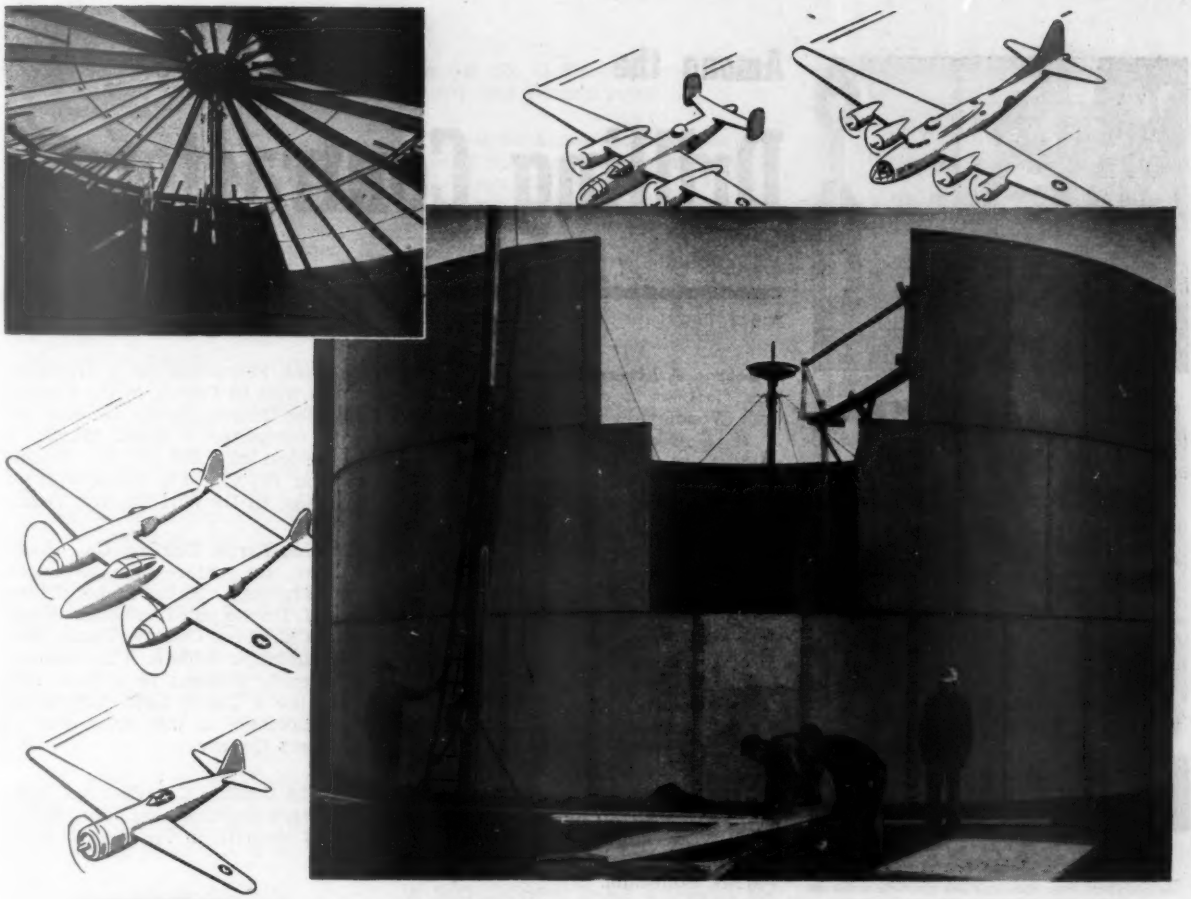

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Among the Drilling Contractors

George P. Livermore, Inc., Lubbock, Tex., last week received contract to drill Woodley Petroleum Co. et al 1 J. H. Howard, a projected 6,200-ft. wildcat test in Hockley County, Texas, 5 miles south of Anton, C NE NE, Section 65, Block A, R. M. Thompson Survey. Derrick is being built for the test which will be drilled on acreage donated by Stanolind Oil & Gas Co. and Honolulu Oil Corp.

R. G. (Tex) Pattillo, Monahans, Tex., is the contractor on E. Russell Lloyd 1 Mrs. E. C. Powell, a shallow Pecos County, Texas, wildcat test which was last reported drilling below 275 ft.

Cron & Gracey Drilling Corp., Houston, Tex., has contracted to drill 14-B Realty Operators for Shell Oil Co., Inc., in the Gibson field, Terrebonne Parish, Louisiana.

Housh & Thompson Drilling Co., Houston, Tex., has finaled 1 Weiss-Hudson, a wildcat test 5 miles southeast of Batson, Hardin County, Texas, for Northern Ordnance, Inc. It was dry at 8,479 ft.

Dixie Drilling Co., Houston, Tex., will drill Texas Co. 1 James Branch, in St. Charles Parish, Louisiana. Dixie has set 10¾-in. casing at 2,700 ft. at 1 Calvert & Todd, which it is drilling for Union Oil Co. of California in Terrebonne Parish.

John E. Bish Well Servicing Co., Houston, Tex., has contracts for two workover jobs in the Jennings field, Acadia Parish, Louisiana. One is on 1 Trushel, for D. D. Feldman. The other is on 2 Christ, for Three Bee Investment Corp.

Rowan & Hope, Inc., Houston, Tex., has the contract for Brewer-Hixon 1 Beard, a 4,500-ft. Vicksburg test to be drilled 3 miles southeast of Clareville, Bee County, Texas.

B & C Well Servicing Co., Houston, Tex., has received from Rio Bravo Oil Co. a contract to work over Rio Bravo 10 fee, in the Pierce Junction field, Harris County, Texas.

Goldrus Drilling Co., Houston, Tex., was moving in material last week for Mackhank Petroleum Co. 1 Freeland, 3 miles west of Pettus, in the Cosden field, Bee County, Texas. Goldrus recently completed 1 Hilda Mugge, a dry wildcat at 7,809 ft., for Pitkin-Goldston Oil Co., 2½ miles west of Nordheim, in De Witt County, Texas.

Golding-Farris Drilling Co., Houston, Tex., set surface pipe last week for 1 Maryetta Mays, to be drilled for R. J. Ursillo and Lombardo Brothers in Chambers County, Texas. Projected depth is 6,600 ft. This contractor recently brought in a good producer, the 1 Tassie Lotz, for Ursillo and associates in the same area of Chambers County.

Wright Drilling Co., Houston, Tex., has started working over John B. Coffee 3-B Mauritz, in the West Mauritz

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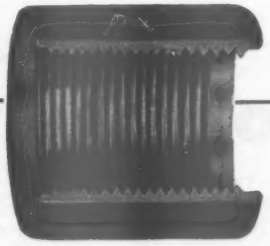

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field, Jackson County, Texas. On its own account it will drill 1 Skarda, in the North McFaddin field, Victoria County.

Henry Schooler, Big Lake, Tex., will drill a wildcat test to 3,500 ft. in northeast Terrell County, Texas, in partnership with Curtis Norman. It will be 1 H. P. Allison, SW SE Section 5, Block 2, C.C.S.D.&R.G.N.G.R.R. Survey, 9 miles south of Sheffield.

Patrick & Tyrell, Houston, have cleaned up fishing job on their 1 Hackett-Pure, Samuel Leeper Survey, 1½ miles north of Sand Flat, Smith County, Texas, and may plug back to try to complete as a producer from the Paluxy which had some porosity and saturation at about 7,300 ft. The test is bottomed at 9,852 ft.

Beacon Drilling Co., Tulsa, was shut down at total depth 6,370 ft. at Devonian Oil Co. 1 Raymond Buck, Parker County, Texas wildcat, waiting for orders to deepen to 7,200 ft. in search of Ordovician pays. The test is located 9 miles southeast of Weatherford.

Crow Drilling Co. has contract for a 6,000-ft. test in Caddo Parish, North Louisiana. The well, H. C. Owens 1 Caddo Levee Board, is a wildcat in the SE SE 12-22n-16w, between the Vivian and Temple pools.

Falcon-Seaboard Drilling Co. was moving in derrick on Carter Oil Co. 1 Johnson, C W½ NE SE 13-17-4w, McPherson County, Kansas, on which it has contract.

Crescent Drilling Co. is starting work at Union Producing Co.'s 8 and 9 Grayling, 5-21n-4e, the Monroe gas field of Union Parish, Louisiana.

Report Emphasizes Essentiality of Oil Workers

The American Association of Oil Well Drilling Contractors has called the attention of its membership to a joint statement by Harold L. Ickes, petroleum administrator, and Paul V. McNutt, chairman of the War Manpower Commission, which greatly serves to clarify the status of the industry, so far as the war effort is concerned. The report reads in part:

"Reports are being received in Washington from a few places to the effect that oil-company employes misunderstood the War Manpower Commission's recent statement about nondeferrable occupations.

"The reports are that oil, natural-gas and gasoline company employes engaged in vital and essential jobs in that industry failed to report for work and were instead seeking employment in munitions plants or some other kind of work which they thought was listed as more essential by the War Manpower Commission.

"Petroleum is regarded as one of the most essential of the war industries and has been so designated previously by the War Manpower Commission.

"Oil and natural gas are vital to this war and it does not help to win the war for men who have been trained and skilled in this industry to leave their present jobs. We wish to emphasize that while planes, tanks and ships fight the battles, they cannot fight without oil to fuel them. The production, refining, transportation and distribution of oil and gas are all necessary."

It is reported that selective service boards in several areas have not placed the petroleum industry as high in essentiality as one or two other war industries.

Stanolind Cancels Hamilton Dome Posting

Stanolind Oil & Gas Co., effective 7 a.m. June 10, canceled its posted price for crude oil in the Hamilton Dome field of Wyoming. Since February 26, 1943, the company posted a flat price of 60 cents per barrel in the Hamilton Dome field.

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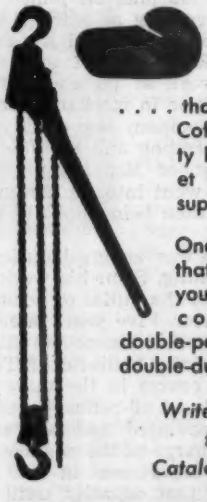

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GEORGE L. MACPHERSON, chief engineer of Imperial Oil, Ltd., Toronto, Ont., started his career with the company 20 years ago as a draftsman and a junior engineer under Thomas Montgomery, who retired January 1 after serving the company nearly 45 years.

When Mr. Macpherson joined Imperial, after serving as a flight lieutenant in the Royal Naval Air Service during World War I and after completing work at Toronto University for a degree in mechanical engineering, the company was chiefly engaged in expanding and building refineries. Most of Mr. Macpherson's early efforts went into the design of the refinery then being built at Calgary.

In 1925 he was assigned duties in process designing. Soon his work involved most of the duties of head designing engineer. Five years later, he was given leave of absence to attend the Massachusetts Institute of Technology for a course in the more advanced details of oil-refinery design.

He was appointed assistant chief engineer in charge of the engineering development department in 1935 and continued in that capacity until his promotion to succeed Mr. Montgomery.

Mr. Macpherson was born in Markdale, Ont. After attending public school in Markdale, he went to Toronto for his high school education, attending the University of Toronto schools. In 1914 he entered the University of Toronto to study mechanical engineering, a course that was interrupted by the previous war.

Joseph P. Gudger, traffic manager of the Gulf companies, Houston, Tex., was reelected chairman of the Southwest Shippers' Advisory Board at the annual meeting of directors on Dallas, Tex. The organization covers Texas, New Mexico, Oklahoma, Louisiana, and Arkansas.

Milton E. Mitchell, Jr., formerly a petroleum engineer for Humble Oil & Refining Co., Houston, Tex., was commissioned a captain recently at the battery officers' school at Fort Sill, Okla., and he has been assigned to Camp Mackall, N. C., where he is division artillery communications officer, commanding the Eleventh airborne division artillery headquarters battery.

Frank B. Roche, Jr., employed in the civil engineering department of Gulf Oil Corp., Houston, Tex., until he enlisted for war service in June 1942, has been commissioned a second lieutenant and is stationed at Craig Field, Alabama. Lieutenant Roche, who attended A. & M. College and University of Houston, was active in football.

Roger D. Barr, laboratory shift foreman for Humble Oil & Refining Co. at its Baytown, Tex., plant, saved a man and three boys from death in Scott's Bay Sunday, June 13. Hearing a call for help, Mr. Barr, in the teeth of a squall, rowed to where the four were clinging to their capsized boat and got them safety to shore. Returning then with others, he helped to recover the bodies of two men drowned in the accident.

Y. C. Tung, engineering graduate of Northeastern University of China, is obtaining experience in drilling and production methods with Humble Oil & Refining Co., Houston, Tex., dividing his time between studying theoretical and engineering work in the office and practical phases of operations in the field. Mr. Tung is credited with discovery of the only producing oil field in China. From a depth of about 1,500 ft., 32-gravity crude is being produced. The course of training in this country is sponsored by the National Resources Commission of the Chinese Government.

R. M. Blackmore, of the land department of the British-American Oil Producing Co., has been placed in charge of a new office opened by the company in Great Falls, Mont. The office is a branch of the Casper, Wyo., office under **H. A. Thompson.**

S. Y. Wong, who is in this country studying pipe-line construction and oil transportation under the sponsorship of the National Resources Commission of the Chinese Government, has completed a 9-month course with Humble Oil & Refining Co., Houston, Tex., and is now in Zionsville, Ind., for further practical training with Shell Oil Co., Inc. He is a graduate of Tang-Shan Civil Engineering College and supervised construction of part of the Burma Railroad. His father is minister of economic affairs in the Chinese cabinet and chairman of the National Resources Commission.

Donald Davis, a scout with Shell Oil Co., Inc., at McLeansboro, Ill., has been transferred to the Tulsa office and will assist in the scouting department. **Jimmie Dwen,** Tulsa, assistant chief scout, has been transferred to the geological department.

L. S. Waite, of Butte, Mont., president of the Waite Oil Co., has been appointed Montana director of marketing for District 4 of PAW. He will handle all matters pertaining to orders and directives of PAW in that state, with headquarters at Butte.

Directors of the Oil Producers Agency of California have appointed a committee consisting of **C. A. Johnson, C. P. Watson** and **R. M. Blodget** to contact OPA and attempt to secure a fair appreciation of conditions confronting the oil industry in the hope that some constructive action may be taken with respect to prices and availability of drilling and production equipment.

Porter L. Howard, former general traffic manager for Sun Oil Co., Philadelphia, Pa., has been appointed deputy director of the ODT Division of Petroleum and Other Liquid Transport, Washington, D. C.

Frank Champion, formerly vice president and general manager of the oil tool division, Byron Jackson Co., has become associated with Glenn H. McCarthy, Inc., oil producer and drilling contractor, Houston, Tex., as general manager of operations. Mr. Champion started in the oil business shortly after the first World War, spending 8 years in drilling and production in various California fields. He entered sales work in 1927 and in 1828 became a partner in the organization of Champion & Barber, Inc., in manufacturing and distribution of oil-field equipment. He joined Byron Jackson Co. in 1932 as sales manager, later being promoted to the position he held prior to his present new connection.

W. H. McKinley has joined the geological department of Stanolind Oil & Gas Co. in the Amarillo, Tex., offices. He was recently released from the engineer corps of the Army. Mr. McKinley was previously in Amarillo with the geological department of Gulf Oil Corp. **Porter Montgomery** will also join the geological department of Stanolind at Amarillo. He has been with the company's seismograph crew working out of Canyon, Tex.

J. Paul Jones, oil operator of Bradford, Pa., has been elected president of the Bradford district, Pennsylvania Oil Producers Association. He succeeds **Arthur C. Simmons.** Other officers elected are **John W. Bryner,** first vice president; **David Scott, Jr.,** second vice president. **George H. Daggett** was reelected secretary-treasurer.

Dan J. Harrison, who was head of Harrison Oil Co. until its stock was sold recently to Magnolia Petroleum Co., is president of the newly organized Indiola Oil Co., with headquarters in Houston, Tex. **W. M. Gaston** is vice president, **Ed F. Heyne** secretary, **J. C. Montgomery** chief geologist, and **H. J. Dunlap** head of the land department. Mr. Montgomery was formerly with the Harrison Oil Co.

Shifts: **E. H. Roy,** superintendent, Cities Service Oil Co., New York City to Lake Charles, La.; **J. Happell,** engineer, Socony-Vacuum Oil Co., Brooklyn, N. Y., to Beaumont, Tex.; **M. M. Fidlar,** geologist, Ohio Oil Co., Bloomington, Ind., to Rock Springs, Wyo.; **C. E. Siberts,** geologist, Kingwood Oil Co., Effingham, Ill., to Evansville, Ind.; **G. R. Adams,** engineer, Humble Oil & Refining Co., Tomball, to Houston, Tex.; **M. M. Miller,** superintendent, Cosden Petroleum Corp., Graham, to Big Spring, Tex.; **T. B. Young,** engineer, Gulf Oil Corp., Daisetta, to Bloomington, Tex.; **J. F. Francis,** superintendent, Lone Star Gas Co., Cisco to Gordon, Tex.; **George Folk,** superintendent, Anderson-Prichard Oil Corp., Hobbs, N. M., to Yukon, Okla.

Claud B. Hamill, independent oil operator of Houston, Tex., went last week, with Mrs. Hamill, to Newport News, Va., for the launching of the new cruiser Houston on June 19. Mrs. Hamill was named by Secretary of the Navy Frank Knox to christen the ship. The original cruiser Houston was lost last year in battle with the Japanese.

In the recent annual election of California oil men, **A. J. Crites** succeeded **H. F. Owen** in District 9 and **J. H. Poe** of Continental Oil Co. succeeded **R. W. French** in District 11 as members of the Conservation Committee of California Oil Producers.

Thomas J. Musgrove, formerly employed at the Texas Co.'s Galena Park, Tex., refinery and a Rice Institute graduate, has been promoted from ensign to lieutenant, junior grade, at Denver, Colo., where he is stationed. Two of his brothers are in war service, and a third is chief accountant for Socony-Vacuum Oil Co. in Cucuta, Colombia.

Nat A. Slagter, unit coordinator for the Lance Creek field, and **Albert Barrett,** geologist for the General Petroleum Corp., have been appointed engineering technical advisers for the production department of PAW for District 4 under **Michael J. Foley,** district director at Denver. They will be ex officio members of the committee.

LaVerne Decker, consulting geologist, for the past 3 years in coastal Louisiana, with headquarters in Alexandria and New Orleans, has returned to Houston, Tex., and opened an office in that city.

Maj. Paul G. Benedum, formerly in charge of Benedum-Trees oil interests in Houston, Tex., and now in Washington, D. C., assigned to the aviation-fuels branch of the Army Air Corps, chuckled when he received a letter from his 11-year-old son, which said in part: "Dear Dad, I got your package and letter. Boy thats a swell glove. No foolin I am proud of you. Wish I was a major. Drop in and tell the president hellow for me. Say dad tell Uncle Mike hellow for me if you get to go to Pittsburgh. Hey, dad, if you ever get back to California and meet some movie stars get me there ottograph. Well I've got redbug bites, hives and poison ivy. It sure is funney I dont have cancer or lepersy. Well I got to go to bed, so I'll say good-bye. Skip."

W. M. Thornbury, Ecuador Oilfields, Ltd.; **C. H. Strickland,** Iraq Petroleum Corp.; **F. D. O. Longe,** Shell subsidiaries in Trinidad; **Dave Dimmitt,** International Petroleum Co., Ecuador, and **C. C. Sutton,** Caribbean Petroleum Co., Venezuela, were guests at the June meeting of the Los Angeles Chapter of Nomads.

W. D. "Bud" Harris, dispatcher for Empire Pipe Line Co. at Ponca City, Okla., has been granted leave to join the War Emergency Pipelines, Inc., at Cincinnati, Ohio.

A. C. Mattei, president of Honolulu Oil Corp., and **J. H. Tuttle,** retired executive of Standard Oil Co., were reelected to the directorate of the California State Chamber of Commerce.

Ernest L. Hauser, member of a rotary drilling crew for Humble Oil & Refining Co. in the Flour Bluff oil field, Nueces County, Tex., until he joined the armed forces in October 1941, has been commissioned a second lieutenant somewhere in the Southwest Pacific.

N. J. ALLEN

N. J. Allen, controller for R E Bering, Los Angeles, Calif., independent operator, has been elected president of the California Petroleum Accountants Society. Other officers are **Charles K. Slack,** General Petroleum Corp., of California, first vice president; **S. J. Anderson,** Ring Oil Co., Ltd., second vice president, and **Alfred F. Hagen,** Shell Oil Co., Inc., secretary-treasurer.

Argo A. Hawkins, who has been with the geological department of Shell Oil Co., Inc., in the Tulsa office for more than 15 years, has joined British-American Oil Producing Co., Tulsa, as chief scout. He succeeds **R. M. (Bob) Blackmore,** who has been transferred to Montana for British-American.

Harold S. Thomas, former geologist of Oklahoma City, Okla., and later a consultant at Lincoln, Neb., has joined the PAW as petroleum analyst, effective June 1.

Market Developments

East Coast

NEW YORK.—Rail shipments of petroleum products to the East Coast last week returned to something like the record volume that preceded the break in the big-inch line but in spite of the improvement, new restrictions designed to conserve critically short gasoline supplies were ordered. The ODT amended General Order 17 which became effective June 18 to prohibit retail delivery of small packages as part of its drive to effect a saving of 25,000 bbl. of gasoline per day. Commercial vehicle consumption had been estimated at 137,000 bbl. per day.

Last reports on tank-car shipments reveal that the total reached 968,535 bbl., an increase of 70,000 bbl. from the previous week. At the same time, kerosene shipments were 15,985 bbl. making the total rail movement 984,522 bbl. per day. Even with this marked improvement the A.P.I. index of available supplies moved up to 26.8, a gain of only 1.2 points. On the corresponding date a year ago the index stood at 49.8, indicating that presently available supplies are only slightly more than half what they were then. By the first of October last year the index had advanced to 59.6.

Mid-Continent

A REDUCTION of 24,000 bbl. in the daily production quota certified for July to producing states in District 2, reflecting a continuation of the declining productivity, this week emphasized the difficulties faced by Mid-Continent refineries in meeting current obligations to domestic customers and the war program. The compulsory reduction in the district's production quota also explained in the most convincing terms possible the competitive condition existing among manufacturers for new supplies of crude oil.

Meanwhile, calls continued brisk for all grades of motor fuel. Interest centered during the past several weeks on competitive-grade gasoline continues, although buyers are turning more frequently to alternate materials. Regular and even premium-grade gasoline are being sought for agricultural purposes. Kerosene and tractor fuels are nearly as scarce as competitive motor fuel.

Burning oils are in relatively light demand for prompt delivery. Most large distributors have storage facilities reasonably well filled for this season of the year and are awaiting movement into consumer channels before pressing primary suppliers for additional shipments. Refiners, on the other hand, are in comfortable position regarding light fuel oils and are not particularly anxious to ship at this season, partially because available transportation facilities are in more acute demand for other products.

Gulf Coast

HOUSTON, Tex.—Modest improvement in transportation facilities of the Gulf Coast territory afforded some encouragement this week in a situation hedged with difficulties. Increased shipments by tanker have had the effect of liberating a few sorely needed tank cars for use by refineries farther inland. Operators in the Corpus Christi area are reported to have been especially benefited.

Refiners and PAW officials of District 3 said it was too early to evaluate results of Directive 67, establishing zones in the six states of the district and fixing rules for distribution of gasoline.

In the case of some of the large refiners the changes necessitated by the new zoning system are inconsequential, since they already were shipping their gasoline to points inside the limits now marked by a zone. Others, however, have had to make important readjustments. Almost all the small plants—those whose gasoline output has gone largely to truckers—find themselves obliged to make drastic changes. PAW officials point out that the primary purpose of the new directive is to see that demand in any locality is filled with minimum draft on transportation facilities.

The gasoline shortage grows more critical, and no substantial relief is looked for until the zoning system has demonstrated its remedial value.

Army and Navy needs were reported to be absorbing the major part of all refinery production, and civilian demand was taking the rest as fast as transportation facilities could carry it. One major refiner reported faint signs of a slightly easier kerosene market. Brokers said they were snapping up all offerings of this product.

Pacific Coast

LOS ANGELES, Calif.—For the second month there has been a gain in the number of service stations operating in Washington, Oregon, California, Arizona and Nevada. On June 1, 1943, there were 5,597 stations closed down as compared with 5,623 idle stations on May 1, 1943. Two bulk distributing plants that were closed down on May 1 were opened up again during the month because the total on June 1 had dropped to 73 idle plants against 75 suspended depots on May 1. The decline in retail sales has also flattened out and the drop from last year will be less than expected. Dispatches from Washington recently indicate that OPA has finally gotten around to recognizing the fact that West Coast marketers have been obliged to pay increased transportation costs due to the use of higher priced methods of transporting refined oil to markets. Tank-car shipments are about three times marine transportation costs and tank-truck costs are also excessive where trucks must be rented.

The Los Angeles Bureau of Light and Power has just completed a new 65,000-kw. steam-turbine generator in the Wilmington district and when this plant begins running to full capacity it will consume approximately 800,000 bbl. of fuel oil annually or the amount of natural gas that would accomplish the same thing. This new installation is the highest pressure and highest temperature unit in California and has the largest boiler installation west of the Mississippi River. This is another good reason why it is necessary for prospectors to discover new fields as there will not be any surplus of fuel oil or natural gas in southern California under present conditions.

A.P.I. REFINERY REPORT

(Figures in thousands of barrels)

Week Ended June 12, 1943

	Dly. crude runs to stills	Stocks: Gasoline	Stocks: Residual	Stocks: Gas oil
Appalachian	158	2,376	518	946
Ind., Ill., Ky.	701	17,694	3,132	4,341
Okla., Kan., Mo.	346	6,418	1,568	1,779
Censored area*	1,779	32,348	12,104	13,570
Rockies	93	1,850	587	330
California	722	20,438	49,743	11,589
Total 6-12-43	3,799	81,114	67,652	32,555
Total 6- 5-43	3,662	82,205	67,461	32,577
Total 6-13-42	3,494	91,846	79,120	30,447

*Reports combined on East Coast, Texas Gulf, Louisiana-Arkansas and Inland Texas at request of PAW.

CRUDE-OIL STOCKS

(Bureau of Mines Estimate)

Week ended:	Bbl. of crude*
June 12, 1943	244,720,000
June 5, 1943	245,107,000
June 13, 1942	253,386,000

*Excludes unrefinable California stocks.

Refinery Prices

(Prices as of June 22)

Quotations are f.o.b plant in cars and in cents per gallon except where otherwise noted. They are exclusive of the federal excise taxes of 1.5 cents a gallon on gasoline and 4.5 cents a gallon on lubricating oils, and do not include marine lighterage charges.

REFINERY GASOLINE

Octane (A.S.T.M.):	†80	74-76	72-74	68-70	63-66
Mid-Continent*	.....	.....	5.875-6.000	.....	5.500-5.625
Pennsylvania	.....	6.750-7.000	.....	.....	.....
Gulf Coast‡	6.00-6.50	.....	§5.750-6.250	§5.750-6.250	§5.250-5.750
Northeast Coast	9.00	.....	9.2	9.2	.....
California	.....	6.125-6.500	6.000-6.125	5.500-6.000	5.000-5.250

*Basis Group 3. †1939 C.F.R. (research method). ‡Integrated companies restricted to lowest prices. §Unleaded.

KEROSENE AND NO. 1 FUEL OIL

Gravity:	46	45	42-44	41-43	38-40
Mid-Continent*	.....	.....	4.500	4.375	.....
North Louisiana	.....	.....	.....	4.500-4.750	.....
Pennsylvania	6.250-6.625	6.125-6.250	.....	.....	.....
California	.....	.....	.....	4.500-5.500	4.250
Northeast Coast	.....	.....	.....	6.80	.....
Gulf Coast	.....	.....	.....	4.125	.....

*Basis Oklahoma Group 3.

TRACTOR, DIESEL, AND BUNKER FUEL OIL

Specifications:	46-48° G.	24 D.I.	48-52 D.I.	58 & above	Diesel bunkers	Residual Bunker C§
Mid-Continent*	4.125	.....	.....	.....	.....	$0.80-1.27
California	.....	2.750-4.000	.....	.....	‡1.35-1.45	0.85-1.00
Gulf Coast	.....	.....	4.000	4.125	1.45	0.85-1.27
Northeast Coast	.....	.....	.....	6.800	2.780	1.65-2.07
North Louisiana	.....	.....	.....	.....	.....	0.80-1.27

*Basis Oklahoma Group 3. †10-14° gravity. ‡Pacific Specification 200. §Gravity range.

FURNACE OIL, GAS OIL, FUEL OIL

	No. 2	No. 3	No. 5	No. 6
Mid-Continent*	3.625-3.750	3.500-3.625	$0.85	$0.80
Pennsylvania (West)	5.875-6.125	5.875-6.000	†5.250-5.500	.....
Northeast Coast	6.7	6.7	1.95	1.65
California	5.5	5.5	‡1.10-1.25	§1.10-1.15
Gulf Coast	3.875-4.0	.....	1.65	0.85

*Basis Oklahoma Group 3 †36-40 gravity fuel. ‡Pacific Specification 300. §Pacific Specification 400.

NATURAL GASOLINE

Grades:	26-70	18-55
Oklahoma (Group 3)	3.875	4.650
North Texas	3.500	4.200
North Louisiana	3.625	4.350
California	4.875	5.500

LUBRICATING OILS

Bright and Steam Refined

OKLAHOMA (Group 3)—

200-210 D, 10-25		27.00
150-160 D, 0-10		23.00
120-125 D, 0-10		22.00
Steam refined:		
600 dark green (untreated)	9.00	9.50

PENNSYLVANIA—

Bright Stocks (Pennsylvania Grade No. 8 color, 140-150 at 210, 545-550 flash)		
10 pour point		30.50
15 pour point		29.50
25 pour point	25.00	28.00
Steam refined:		
600	15.00	16.00
650	15.50	16.50
600 flash	16.00	17.50
630 flash	17.00	17.50

Neutral Oil

(Vis. at 100° F. except Pennsylvania and color N.G.A.)

OKLAHOMA (Group 3)—

0-10 pour point:	
300-3	15.00
300-3	18.00
500-3	19.50
600-3	20.00

Note: Viscous neutrals, 10-25 pour, quoted 0.5 cent under 0-10 oils.

Neutral Oils

CALIFORNIA—

Pale oils:		
200-2½-3	7.00	7.75
400-3-4	7.25	8.00
600-3-4	8.75	11.00
Red oils:		
200-4-5	7.00	7.75
400-5-6	9.00	11.00
500-900, 5-6½	9.25	11.25

GULF COAST—

Pale oils:		
200-3	8.50	8.75
300-3	9.00	9.25
500-3½	9.75	10.00
750-3½	10.00	10.25
2,000-4	10.50	10.75
3,000-4	12.25	12.50

PENNSYLVANIA—

150 vis. at 70° F., 3 color, 400-405 flash:	
Zero pour point	37.50
10 pour point	36.50
15 pour point	35.50
25 pour point	30.00
200 vis. at 70° F., 3 color:	
Zero pour point	39.50
10 pour point	38.50
15 pour point	37.50
25 pour point	32.00

WAX

(Cents per pound)

OKLAHOMA (Group 3)—	
124-126 (A.m.p.) w.c. scale	4.250
PENNSYLVANIA (inland refineries)—	
122-124 (A.m.p.) w.c. scale	4.250
124-126 (A.m.p.) w.c. scale	4.250
NEW YORK—	
Wax in bags fully refined:	
130-132 (A.m.p.) wax	5.850
133-135 (A.m.p.) wax	6.150
Crude scale:	
124-126 (A.m.p.) w.s.	4.250
124-126 (A.m.p.) y.s.	4.250

TANK-WAGON PRICES IN 50 CITIES

(Gasoline prices based on regular grades, tax included, undivided dealer)

ATLANTIC AND NEW ENGLAND

(Socony-Vacuum Oil Co., Inc., and Atlantic Refining Co.)

	Dealer tank wagon	Combined tax	Kero. tank wag.
Baltimore, Md.	15.95	5.50	10.50
Boston, Mass.	14.90	4.50	10.10
Burlington, Vt.	16.90	5.50	10.30
Buffalo, N. Y.	16.20	5.50	10.90
Dover, Del.	16.70	5.50	12.20
Hartford, Conn.	15.60	4.50	10.00
Manchester, N. H.	17.30	5.50	12.10
Newark, N. J.	15.20	4.50	10.00
New York, N. Y.	16.10	5.50	10.10
Philadelphia, Pa.	16.20	5.50	11.95
Pittsburgh, Pa.	16.70	5.50	12.20
Portland, Me.	16.30	5.50	10.20
Providence, R. I.	15.00	4.50	9.90
Washington, D. C.	15.20	4.50	11.30
Average 14 cities	16.02	5.14	10.85

(All prices undivided dealer basis.)

CENTRAL

(Standard Oil Co. of Indiana, Standard Oil Co. of Ohio, Continental Oil Co. and Texas Co.)

	Dealer tank wagon	Combined tax	Kero. tank wag.
Chicago, Ill.	13.40	4.50	10.30
Cleveland, Ohio	15.00	5.50	*9.00
Dallas, Tex.	13.00	5.50	7.00
Des Moines, Iowa	14.40	4.50	9.90
Detroit, Mich.	14.40	4.50	9.60
Fargo, N. D.	16.90	5.50	11.20
Huron, S. D.	16.30	5.50	10.70
Indianapolis, Ind.	15.20	5.50	9.80
Little Rock, Ark.	17.50	8.00	10.00
Milwaukee, Wis.	16.10	5.50	10.50
Minneapolis, Minn.	15.40	5.50	10.30
Omaha, Neb.	15.40	6.50	9.80
Tulsa, Okla.	16.50	7.00	8.50
Wichita, Kans.	12.70	4.50	8.00
Average 14 cities	15.15	5.57	9.61

*Includes 1-cent state tax.

SOUTHEASTERN

(Standard Oil Companies of New Jersey, Kentucky, and Louisiana)

	Dealer tank wagon	Combined tax	Kero. tank wag.
Atlanta, Ga.	18.90	7.50	*11.50
Birmingham, Ala.	18.50	8.50	9.00
Charleston, S. C.	18.95	7.50	....
Charleston, W. Va.	19.25	6.50	13.30
Charlotte, N. C.	20.10	7.50	11.30
Jacksonville, Fla.	18.90	8.50	9.50
Jackson, Miss.	17.50	7.50	†9.00
Louisville, Ky.	16.50	6.50	8.50
Memphis, Tenn.	17.90	8.50	10.50
New Orleans, La.	17.75	8.50	*10.00
Norfolk, Va.	17.45	6.50	12.30
Average 11 cities	18.34	7.50	10.49

*Includes 1-cent state tax.
†Includes ½-cent state tax.

MIDWESTERN

(Continental Oil Co.)

	Dealer tank wagon	Combined tax	Kero. tank wag.
Albuquerque, N. M.	17.50	7.50	10.00
Boise, Idaho	20.10	6.50	16.50
Casper, Wyo.	17.00	5.50	12.00
Denver, Colo.	14.50	5.50	11.00
Helena, Mont.	17.00	6.50	13.00
Phoenix, Ariz.	18.50	6.50	12.50
Reno, Nev.	17.50	5.50	13.50
Salt Lake, Utah	18.50	6.50	14.50
Average 8 cities	17.58	6.25	12.88

PACIFIC COAST

(Standard Oil Co. of California)

	Dealer tank wagon	Combined tax	Kero. tank wag.
Portland, Ore.	17.00	6.50	13.80
San Francisco, Calif.	14.50	4.50	11.50
Seattle, Wash.	17.00	6.50	13.80
Average 3 cities	16.17	5.83	13.03
Average 50 cities	16.55	5.96	10.87

JARECKI MFG. CO
WHOLESALE AND RETAIL
MANY STYLES OF ARCHITECTURE . . . .
JARECKI MFG. CO
OIL FIELD SUPPLIES
ONE STANDARD OF SERVICE

PICTURED at the left is what we believe to be the oldest establishment of its kind in the world — the Jarecki store at Clarendon, Pa.

Opened in 1883, it has been serving the needs of oil men ever since.

On the right is shown our Houston store, opened in more recent years — trim, compact, modern.

From an architectural standpoint, these stores are as different as the periods in which they were established. But from a service standpoint, they are identical. Each is a convenient local source for soundly designed and ruggedly built oil well supplies. Each is part of a chain that has grown with the industry it serves.

To succeeding generations of oil men, Jarecki oilfield stores are landmarks of helpful service as familiar and friendly in their field as the general store in crossroads communities — and serving just as important a purpose.

JARECKI

MANUFACTURING COMPANY

"Since 1852"

General Offices: St. Louis, Mo. Home Office and Factory: Erie, Pa., U.S.A. District Offices: Tulsa and Bartlesville, Okla.; Dallas and Houston, Texas; Mt. Pleasant, Mich.; Centralia, Ill.; Owensboro, Ky.

Branch Stores at All Important Places in the Oil Country

Equipment Progress

Wickwire Spencer Plant Receives Citation

Wickwire Spencer Steel Co. has received its first gold star for its Palmer, Mass., wire rope plant from the United States Maritime Commission, E. C. Bowers, president, announced. This plant last October received from the commission the first Maritime "M" awarded to any plant in New England.

In recognition of continued outstanding production, Adm. H. L. Vickery notified Mr. Bowers that the company should add a gold star to the Maritime "M" burgee and that the "M" badge would be awarded to 325 additional employes.

Trade Literature

D. W. Haering & Co., Inc., 205 West Wacker Drive, Chicago.—A new 8-page bulletin describes the latest developments in proportioning and sampling equipment. Construction, operation and application of the new and improved Nelson chemical-proportioning pump are discussed. This is the synchronized drive chemical pump which has gained wide favor in the solution of proportioning problems in the petroleum and water conditioning industries. The fluid-piston principle, basis of the popular Model "B" feeder and all Haering proportioning and sampling machines is explained and thoroughly discussed with reference to design, construction and operation of these machines. The bulletin, profusely illustrated with diagrams, installation photographs and tables, presents the subject in a complete, concise and orderly fashion.

Preload Co., Inc., 47-38 Fifth Street, Long Island City, N. Y.—An 8-page folder on crackless concrete construction. It describes a system of reinforced concrete construction involving a different relation between steel and concrete. Illustrations show adaptations of the process for water reservoirs, tanks for chemical and paper plants and tanks for fuel-oil storage.

Babcock & Wilcox Tube Co., Beaver Falls, Pa.—A new, complete, combined list of standard steels of the American Iron and Steel Institute and the Society of Automotive Engineers has been issued as a technical data card, No. 119A. Also, the company has issued a new revised list of standard specifications for seamless tubes and pipe, arranged in handy finger-tip form. This is issued as Technical Data Card No. 107B.

Norton Co., Worcester, Mass.—Folder on the Norton Open Structure grinding wheel. The folder illustrates the types of work for which this type of wheel is recommended.

KEROTEST GETS GOLD STAR FOR PENNANT

Photograph taken at ceremony attendant to awarding gold star to Kerotest Manufacturing Co., Pittsburgh, Pa., for their Maritime "M" pennant. In front of flag is Charles W. Walsh, Jr., director of procurement, U. S. Maritime Commission, shaking hands with Walter G. Swaney, Kerotest's general manager. Holding the flag are William Householder and Bruno Wandelt, of Kerotest Victory Merit Star Committee

Foster Wheeler Corp. Gets Fifth Citation

For the fifth time employes of Foster Wheeler shops were honored by the Navy Department for maintaining high production of war equipment. On May 14 Rear Adm. Clark H. Woodward conferred the Army-Navy "E" burgee with two stars upon the Carteret, N. J., plant. The Dansville, N. Y., works has received two awards, thus making a total of five.

Lt. Comdr. J. Douglas Gessford, Jr., acted as master of ceremonies and Lt. Comdr. W. S. Downs, assisted by Lt. H. C. Ressler, U. S. Army, awarded insignia pins to a man and a woman representing the shop personnel.

H. K. Porter Co. Purchases Quimby Pump Co.

Purchase of Quimby Pump Co., with plants at Newark and New Brunswick, N. J., by H. K. Porter Co., Inc., Pittsburgh, Pa., has been announced by T. M. Evans, president of the Pittsburgh firm.

Established before the turn of the century, Quimby Pump Co. manufactures a full line of pumps, including screw, centrifugal and rotex types used in industry. At present the company is also building considerable quantities of pumps for both the Navy and Maritime Commission.

The Quimby plants will be operated as a division of H. K. Porter Co., Inc., a manufacturer of industrial locomotives and chemical processing equipment, Mr. Evans said. The purchase, he added, was made in order to further diversify H. K. Porter Co., Inc.'s line of products.

Excel-So Water Separator

One of the problems in connection with aircraft refueling units, bulk storage transport trucks, refinery and terminal reloading racks has been to keep water from the fuel. Now aviation gasoline containing not more than 1/100 of 1 per cent of undissolved water may be delivered to either trucks or planes. This result is achieved by the new Excel-So separator developed by the Warner Lewis Co., Tulsa.

These new separators are manufactured in various capacities from 50 to 500 g.p.m. The 300-g.p.m. unit is designed particularly for airport service and consists of a horizontal tank 24-in. by 60-in. Four-inch flanged inlet and outlet connections are provided at opposite ends of the separator. Interior construction consists of a contact chamber near the inlet and a settling chamber at the downstream end. A water accumulator is

also provided at the bottom of the outlet end.

The manufacturer guarantees that its separator will deliver gasoline containing not more than 1/100 of 1 per cent of undissolved water regardless of whether the water is in free form or as an emulsion. This is considered safe in so far as aviation fuel is concerned.

PRODUCER OF WAR EQUIPMENT HONORED

Raising the national colors at the Army-Navy E presentation ceremonies at the factory of the Climax Engineering Co., Clinton, Iowa

Among Equipment Men

Snetsinger Heads New Schaub Division

E. J. Snetsinger has been appointed general manager of Magnetrol, Inc., a newly organized division of the Fred H. Schaub Engineering Co., Inc., Chicago, manufacturers and designers of condensate return and boiler-feed equipment. This new division will assume complete control of the manufacture and sale of Magnetrol automatic liquid-level control units.

According to Mr. Snetsinger, the Magnetrol was originally developed as a boiler water level control unit for Schaub systems. During the past 2 years the application of the Magnetrol to other types of industrial liquid-level control problems has increased to the point where it has become necessary to establish new manufacturing and sales facilities.

General American Announces Appointments

General American Transportation Corp. announces the election of three new vice presidents: Horace E. Coyl and Donald H. Smith, of Chicago, and William J. Stebler, of Sharon, Pa.

The company further announces that its vice president, Cyrus L. Philipp, will hereafter direct the company's sales while continuing in charge of the operation of refrigerator cars including those of Union Refrigerator Transit Lines, a division, of Milwaukee, Wis.

O. J. Parks has been appointed mechanical assistant to the first vice president, and Edward J. Campbell has been appointed chief maintenance officer. J. C. Acworth is now an assistant vice president.

Sherwin-Williams Makes Ruthruff Research Chief

The Sherwin-Williams Co., one of the world's largest paint and varnish manufacturers, last week announced the appointment of Dr. Robert F. Ruthruff as director of research for Sherwin-Williams and its allied companies.

Dr. Ruthruff, a graduate of the University of Michigan, as well as a former member of the teaching staff of that institution, prior to joining the Sherwin-Williams organization in 1939 was associated with E. I. du Pont de Nemours & Co., Standard Oil Co. of Indiana and the M. W. Kellogg Co.

At the Standard of Indiana, Dr. Ruthruff was in charge of experimental cracking, catalytic and high-pressure synthesis. While engaged in this work he developed methods of making gasoline through polymerization of petroleum waste gases under high pressure and high temperature without a catalyst. His experimental cracking development in a large measure led to erection and utilization of large combination cracking units.

At the M. W. Kellogg Co., Dr. Ruthruff developed a low-temperature catalytic - polymerization process, again for the utilization of waste gases. He also was engaged in the erection of catalytic cracking plants in England and on the Continent which utilized synthetic-cracking catalysts developed by him.

Prior to his appointment as research director, Dr. Ruthruff had been in charge of oil research for Sherwin-Williams.

Cooper-Bessemer Corp. Promotes Two Key Men

Two top executives of Cooper-Bessemer Corp., manufacturer of engines and compressors at Mount Vernon, Ohio, and Grove City, Pa., have been promoted to positions of greater responsibility.

Carl H. Vaupel, who joined the company in 1941 and since then has devoted his attention to various managerial duties, becomes assistant general manager.

George Johnstone, Jr., formerly assistant foundry superintendent at the Grove City, Pa., plant, has been promoted to the position of foundry manager.

S. A. Huffman Appointed Kobe Production Manager

Samuel A. Huffman has been appointed plant manager of Kobe, Inc., Huntington Park, Calif. According to C. M. Rader, assistant general manager, Mr. Huffman will be in complete charge of hydraulic manufacturing.

Mr. Huffman, graduate of the University of Cincinnati, is a mechanical engineer whose first position was as a machine designer of automatic machinery for the U. S. Playing Card Co. of Cincinnati. In 1935 he joined the Miller Printing Co. of Pittsburgh, Pa., where he was responsible for the redesigning of the presses and machinery they manufactured and sold. Later, he became plant manager for this company—a position responsible for the manufacture of some 20,000 parts, many of a precision nature.

Later, Mr. Huffman became associated with the Arms Franklin Corp., who had taken on war contracts for telemotor receivers for steering engines, in addition to the manufacture of anchor and capstan windlasses and ram groups for the Navy, and in 3 months succeeded in doubling their production.

Steel for 4 catalytic cracking plants

Four of the latest-type catalytic cracking plants, which can shift production from high-octane gasoline to butadiene—a base for synthetic rubber—in only eight hours, are now rising in Texas, Oklahoma, and Wyoming.

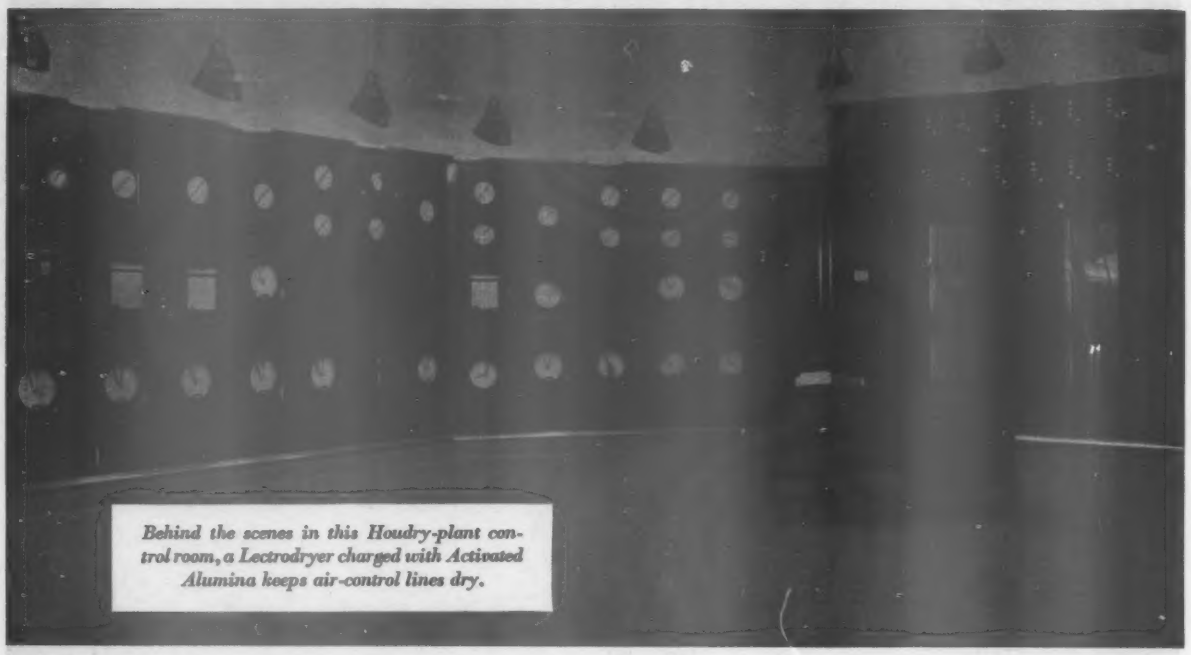
Bethlehem is helping to build these plants. For one of them, this company is fabricating and erecting a 700-ton structure and 1200 tons of platework for a regenerator, a deisobutanizer reflex accumulator and receiver, two catalyst storage hoppers, two reactors, some large diameter pipe, and a considerable number of minor items. All told, Bethlehem is supplying over 5100 tons of fabricated steel for the four plants, and is erecting over 2300 tons of it for one of them.

In supplying and erecting steelwork for these key wartime projects, Bethlehem's Fabricated Steel Construction Division applies the same skill and know-how in steel construction that have served the petroleum industry on so many building projects during the peacetime years . . . and that will again serve the industry, when Victory is ours.

★ ★ ★ BETHLEHEM STEEL ★ ★ ★

Activated Alumina

POLICES AIR-CONTROL LINES



Behind the scenes in this Houdry-plant control room, a Lectrodryer charged with Activated Alumina keeps air-control lines dry.

Here's a place where Activated Alumina is of prime assistance in the production of war-important petroleum products—as an efficient, certain drying agent.

Pneumatic controls are used in the Houdry system to permit fine, even modulation in the control of all operations. But there dare not be any moisture in the air lines or valves to clog or freeze and upset the entire system. That's where Alorco Activated Alumina takes a hand, freeing this air of every trace of moisture.

Alorco Activated Aluminas are drying air, gases, and organic liquids to dew points below −110° F., on all kinds of war work. Yields and recoveries are thereby increased; constant quality is maintained; corrosion is eliminated. When the Activated Alumina becomes moisture-laden, it is reactivated by heating, and is restored to its original high efficiency. Standard equipment is available which performs these functions.

In many cases, Activated Alumina may have a place in your plant or processes. Tell us your drying problems. ALUMINUM COMPANY OF AMERICA (*Sales Agent for* ALUMINUM ORE COMPANY) 1967 Gulf Building, Pittsburgh, Pennsylvania.

"ALORCO" ALORCO Reg. U.S. Pat. Off. PRODUCTS

ACTIVATED ALUMINAS

HOW TO INCREASE THRU-PUT BY ONE SIMPLE CHANGE

Pinwheel Action STEPS UP RATINGS

Installing Coppus-Dennis FANMIX Gas Burners permits increased heat release per cubic foot of furnace volume

"Pinwheel Action" combines gas with air in a properly proportioned mixture. Gas escaping from orifices in the blades, rotates the fan, causing in-take of air at right angles to path of gas. The energy in gas under pressure is utilized to perform work by mechanically mixing and proportioning the gas with just the proper amount of air, thus eliminating from the furnace the necessity of serving as a mixing chamber as well as combustion space.

You get so much more heat release per cubic foot of furnace volume when you change to Coppus-Dennis FANMIX Gas Burner that rating of boilers (or other equipment) can be increased far beyond the limit allowed by present burners.

New Principle in Gas Burners Gives EXTRA Values on Top of GREATER HEAT RELEASE

Even Temperature: complete combustion without impingement—no drifting "hot spots". *No Cracking of Wet Gas:* driver arms stay below "cracking" temperature. *On New Installations:* smaller combustion space, less stack required, no forced draft equipment needed. Write for free Booklet 410-3 which explains *other* savings you make with Coppus-Dennis FANMIX Gas Burner — a Coppus "Blue Ribbon" Product. Address: Coppus Engineering Corporation, 396 Park Avenue, Worcester, Massachusetts.

You'll get valuable ideas from these free bulletins on other Coppus Blue Ribbon Products

(Check the ones you want)

☐ Coppus Unit Air Filters. For industrial ventilating and air conditioning systems. Bulletin F-320-5.

☐ Coppus Heat Killers. Keep production up by keeping men cool. No stale air recirculation. Air is directed. Bulletin 160-5.

☐ Coppus Cable Manhole and Tank Ventilators. For confined working spaces. Bulletin 163-1.

☐ Coppus Boiler Manhole Blowers and Exhausters. For cooling boilers, drums, etc. Bulletin 161-3.

☐ Coppus Steam Turbines. 6 sizes (and prices) from 150 H. P. down to fractional. Bulletin 135-9.

☐ Coppus-Dennis Fanmix Gas Burner (described in this ad).

Name.....

Company.....

Address.....

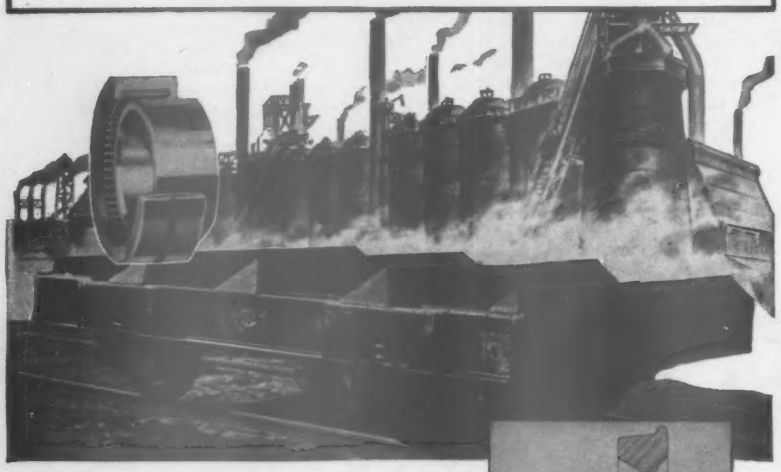
City.....State.....

COPPUS

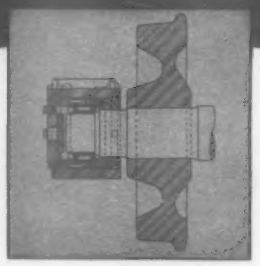
Sales Offices in THOMAS' REGISTER. Other "Blue Ribbon" Products in Refinery Catalog.

COPPUS BLUE RIBBON PRODUCTS DESIGNED FOR YOUR INDUSTRY . . . ENGINEERED FOR YOU

IN THE NEWS
WITH TORRINGTON—BANTAM

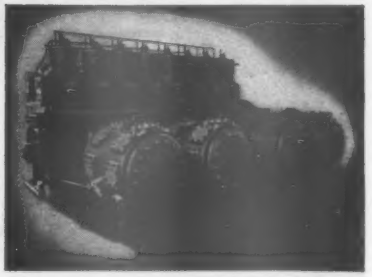


25 TONS OF CHARGE are carried by buggies like this one, to feed the steel furnaces at the Kaiser plant on the West Coast. Constructed by the American Car and Foundry Company, these cars employ Needle Bearings Type NCS on the axles, as shown in drawing. Efficient service is contributed by the low friction coefficient, high load capacity and effective lubrication method of these bearings.



FARM PLANTING is made easier by this heavy-duty "Rototiller" which prepares seed beds all ready for planting in a single operation. Needle Rollers Type LN are assembled into economical, high-capacity anti-friction bearings on both ends of the connecting rods and on the wheels of this progressively designed unit. The rollers at the wrist pin end are projected beyond the connecting rod in such a way that they are constantly lubricated by a fog of oil from the crankcase. At the lower end, oil catches are used.

DRILL PRESS OPERATION was obtained in this Black & Decker portable drill through the development of a radial arm attachment to speed production in an airplane factory. Compact arm design and flexibility over a wide radius of operation are combined with anti-friction performance through the use of NCS Needle Bearings—a typical case where the small size and high load capacity of these bearings have proven important advantages.



NO TIME FOR SHUTDOWNS in the oil industry—and these sturdy two-cycle, gas-engine-driven compressors built by Clark Bros. Co. Inc., are designed for service 24 hours a day. Type NCS Bearings are used in the wrist pins of the scavenging pump crossheads where the high load capacity of these bearings assures smooth, reliable performance. A catalog containing complete data on our line of Needle Bearings will be gladly sent upon request. Just write for Bulletin J-104.

NEEDLE BEARINGS FOR ALL PURPOSES, as well as special and standard anti-friction bearings of every type, are available from one source through the combined facilities of Bantam and Torrington. Here, too, is experienced skill to serve you in the unbiased selection or design of bearings to meet any requirement. For the utmost satisfaction in the solution of *your* bearing problems, TURN TO BANTAM.

ARMY NAVY

TORRINGTON BEARINGS

STRAIGHT ROLLER · TAPERED ROLLER · NEEDLE · BALL

THE TORRINGTON COMPANY · BANTAM BEARINGS DIVISION

SOUTH BEND, INDIANA

It's no good if he doesn't know how to use it!

• It's an odds-on bet . . . sometime soon one of your men will face a fire, armed with one of your extinguishers.

Will he know what to do? Will this man in your plant know what kinds of fire this extinguisher should be used against? Does he know how to make it work?

There is one sure way to control blazes in your plant—fast and sure-handedly. Teach key men how to handle fire . . . how to handle fire-fighters. *Stage demonstrations. Show these men how extinguishers behave under fire.* We can help you do it.

A new Kidde handbook—"How to Teach Fire-Fighting"—tells how to stage a fast-moving, interesting, instructive demonstration of extinguishing methods. Send for your copy. Walter Kidde & Company, Inc., 639 Main St., Belleville, N. J.

Kidde PROTECTS LIVES

every feature points to rugged service

GARDNER-DENVER "FX" POWER SLUSH PUMPS

SPECIFICATIONS	
SIZE	CAPACITY U. S. GALLONS PER MINUTE
7¼ x 10	450
7¼ x 12	495
7¼ x 14	577
7¾ x 16	693
7¾ x 20	774
All sizes may be furnished with reduced sizes of liners and pistons for higher pressures.	

1. Fluid cylinders, frames, and other parts are sound, strong, wear-resistant castings of GarDurloy.
2. SLUSH-PROOF hardened liners and rods—SLUSH-PROOF Duo-Seat valves.
3. Divided fluid cylinder construction—no inner baffles, or metal sections to be cut through by mud.
4. Positive flood lubrication assures adequate lubrication of all working parts.
5. Oil-stop and mud-stop heads keep mud and water out of power end.

For complete specifications, write Gardner-Denver Company, Quincy, Illinois • Dallas • Houston • Tulsa • St. Louis • Los Angeles • San Francisco • New York • Chicago • Pittsburgh • Republic Supply Company (of California), 2122 East 7th Street, Los Angeles, California • Continental Supply Company, Continental Building, Dallas, Texas

GARDNER-DENVER
Since 1859

WHEN SIMPLIFICATION KNOCKED OUT HALF OF THE LINE

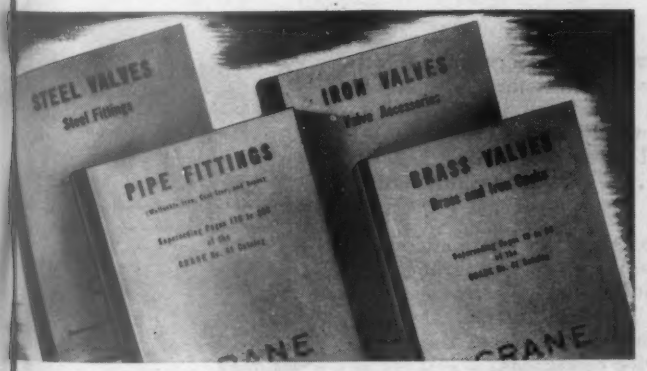
SIMPLIFICATION of lines—whether bicycles or valves—is a part of the wartime program to conserve vital materials. Manufacturers who have simplified their lines are able either to produce necessary minimum output with less raw material or to increase production of those items which are vitally needed to win the war. At Crane for example, reducing by more than half the variety of valves and fittings in the line has enabled the great Chicago Works to double and redouble its output of material for the Navy, the Merchant Marine and essential industry.

But product simplification frequently means inconveniences to users. Manufacturers' catalogs are made obsolete. They are no longer reliable sources of information.

Recognizing this condition Crane Co. is introducing a cataloging innovation in the valve and fitting industry. Individual catalog sections are issued as each class of product is brought under the Simplification program. Pages from the latest catalog are reproduced with markings to show instantly what products have been eliminated and what are available. Noteworthy is the fact that the Crane line is still the most complete in the industry.

But this improved cataloging is only one phase of Crane service. Through branches and wholesalers Crane offers the services of experienced men to aid you with any valve or piping problems. And to plant managers, Crane offers Piping Pointers Bulletins, a service to aid in securing the greatest possible satisfaction from pipe lines.

CRANE CO., 836 So. Michigan Ave., Chicago, Illinois



For years the Crane Catalog has been recognized as a real piping handbook. Under wartime simplification the Crane catalog service becomes even more valuable. The new individual catalogs whose pages are exact reproductions from those of the large general catalog are designed to show at a glance products still obtainable. As seen in the major illustration above a system of shading, or crossing out indicates which products have been eliminated, providing a quick reference for convenience in writing specifications.

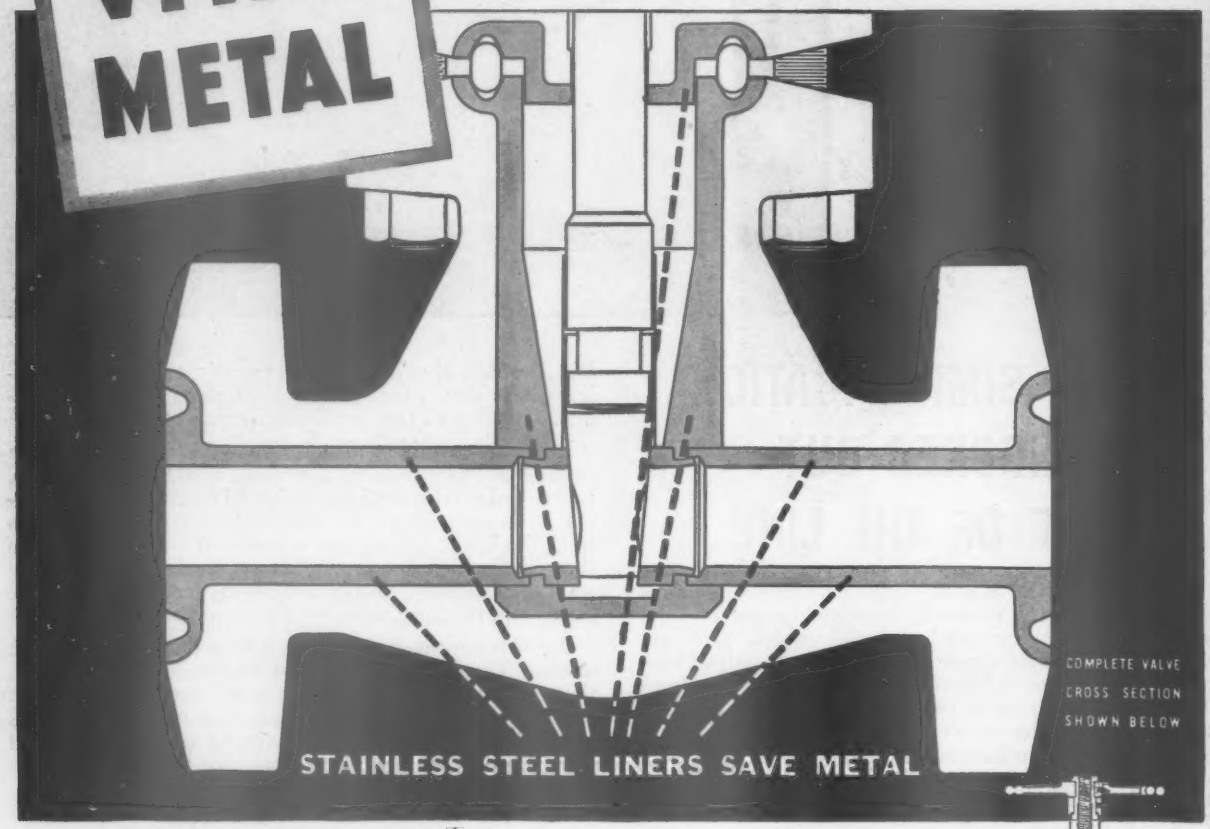
With valves so vital to victory, it is important that pipe lines be kept at full operating efficiency—that every valve give its full measure of service. To assist plant managers in training new maintenance men—to aid old timers with short cuts on valve repair—Crane has issued a series of Piping Pointers Bulletins. They contain simple, practical information on valve selection and valve maintenance. Copies will be supplied to any manufacturing plant faced with piping problems.

ARMY E NAVY

CRANE VALVES

SAVE UP TO 75% OF VITAL METAL

with Vogt STAINLESS STEEL LINED DROP FORGED STEEL VALVES*



★ ★

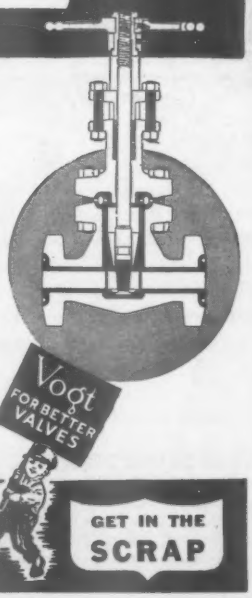
Vogt*

GATE VALVE AND SLIDE VALVE TYPES AVAILABLE

★

The War Program demands conservation of all strategic metals that are vital to victory. Therefore, by specifying stainless steel lined valves in flow control services involving severely corrosive-erosive or high temperature liquids and gases, as much as 75% of the vital metal can be saved . . . a definite contribution to the war effort!

Vogt *stainless steel lined* drop forged steel gate and slide valves are serving today in many applications throughout industry. Liners of the stainless analyses for specific operating conditions are of 3/16″ minimum thickness and usually extend to the contact surfaces of the three body flanges for extreme service conditions.



HENRY VOGT MACHINE CO.
Incorporated
LOUISVILLE, KENTUCKY
BRANCH OFFICES NEW YORK PHILADELPHIA CLEVELAND CHICAGO DALLAS

GET IN THE SCRAP

Granddaddy OF THE JEEP

A Marmon-Herrington *All-Wheel-Drive* converted Ford is credited with being the prototype of the army Jeep, by Earl Godwin in his Ford Motor Company's radio program "Watch the World Go By," on March 15th.

In September 1936, Marmon-Herrington engineers produced the first half-ton passenger-carrying vehicle having power and traction applied through all four wheels. This was a standard Ford "pick-up" truck converted to *All-Wheel-Drive* in the Marmon-Herrington plant. "The Jeep," said Earl Godwin, "merely applies the same principles of design to still smaller and lighter (¼-ton) vehicles."

This company's greatest contribution to the war effort has not been production, although thousands of trucks, tractors and tanks of our manufacture are now serving the United Nations on all fronts. Of far greater importance, in our opinion, have been the many "firsts" in concept and engineering developments which we have passed along to others having greater output facilities for actual production.

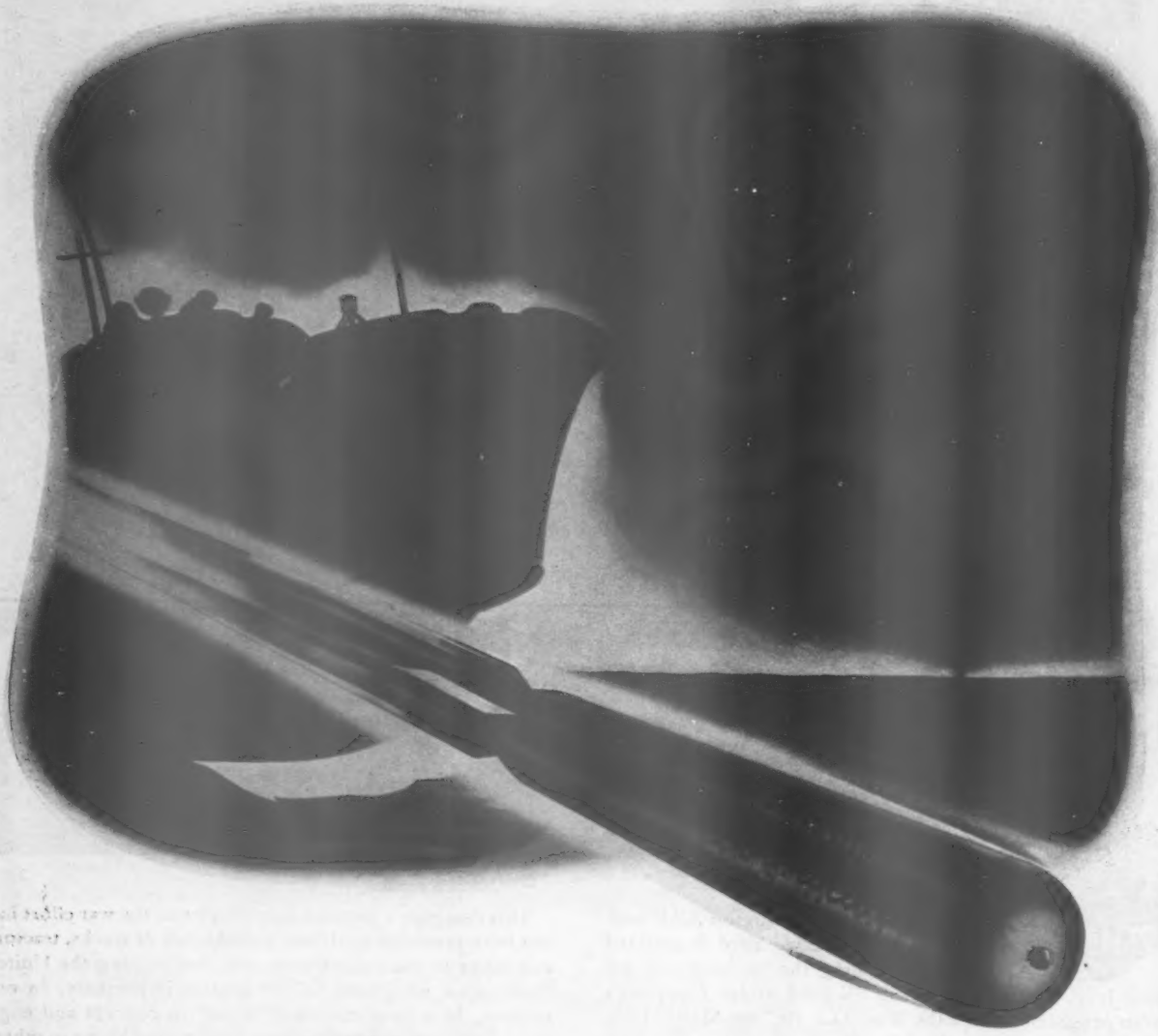
The same genius which created the first conversions of mass-production vehicles to *All-Wheel-Drive;* the first high speed track-laying tractor, and the first half-track truck with driving front axle, will provide outstanding advancements in civilian vehicles, too, after this war is won.

HELP SPEED "V" DAY, THE BOND SAVINGS WAY!

MARMON-HERRINGTON

All-Wheel-Drive

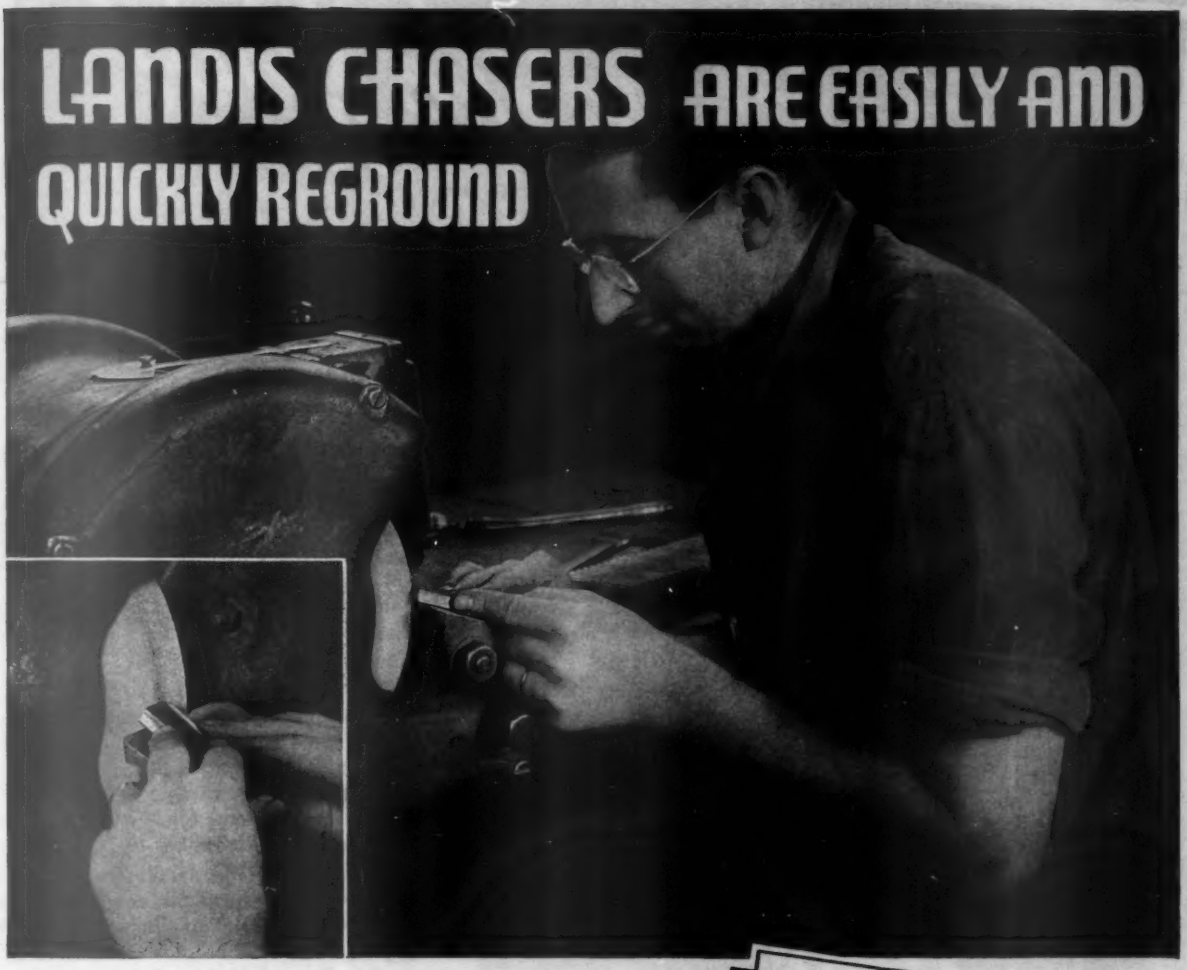
Seismic salutation!



WHEN our PT boats roar out over the horizon to "expend" an enemy ship we like to ponder over the possibility that the fuel and explosives which make their heroic missions possible may have come from some of the numerous oil-bearing structures which we have successfully mapped.

SEISMIC EXPLORATIONS, INC., HOUSTON

LANDIS CHASERS ARE EASILY AND QUICKLY REGROUND



A simple grinding operation renews the entire cutting edge and leading feature, retaining, after each grind, the initial accuracy of the chaser.

Avoid overheating, use mechanical rests, check throat and lip rake angles, grind uniformly and only so much of the chaser as is worn and you are assured quality threads and long chaser life.

The Finest Thread Cutting Tool in Industry

12 Features of the LANDIS TANGENTIAL CHASER

1–Permanent throat permits close to shoulder threading throughout life of chasers
2–Rake angle range covers all machinable materials
3–Free cutting condition permits maximum cutting speeds
4–Simple grinding operation renews entire cutting edge and leading feature
5–Line contact with work lessens friction and minimizes thread distortion
6–Leading feature insures thread of accurate lead
7–Lateral absorption of cutting strain reduces vibration and chaser breakage
8–Right and lefthand threading feature reduces chaser equipment
9–Standard chasers thread all diameters with proper chaser holders
10–Interchangeability of chasers lowers operating cost
11–Chaser length provides exceptionally long life and low tool cost
12–Permanent throat gives equal distribution of cut

LANDIS MACHINE COMPANY

WAYNESBORO, PA., U.S.A.

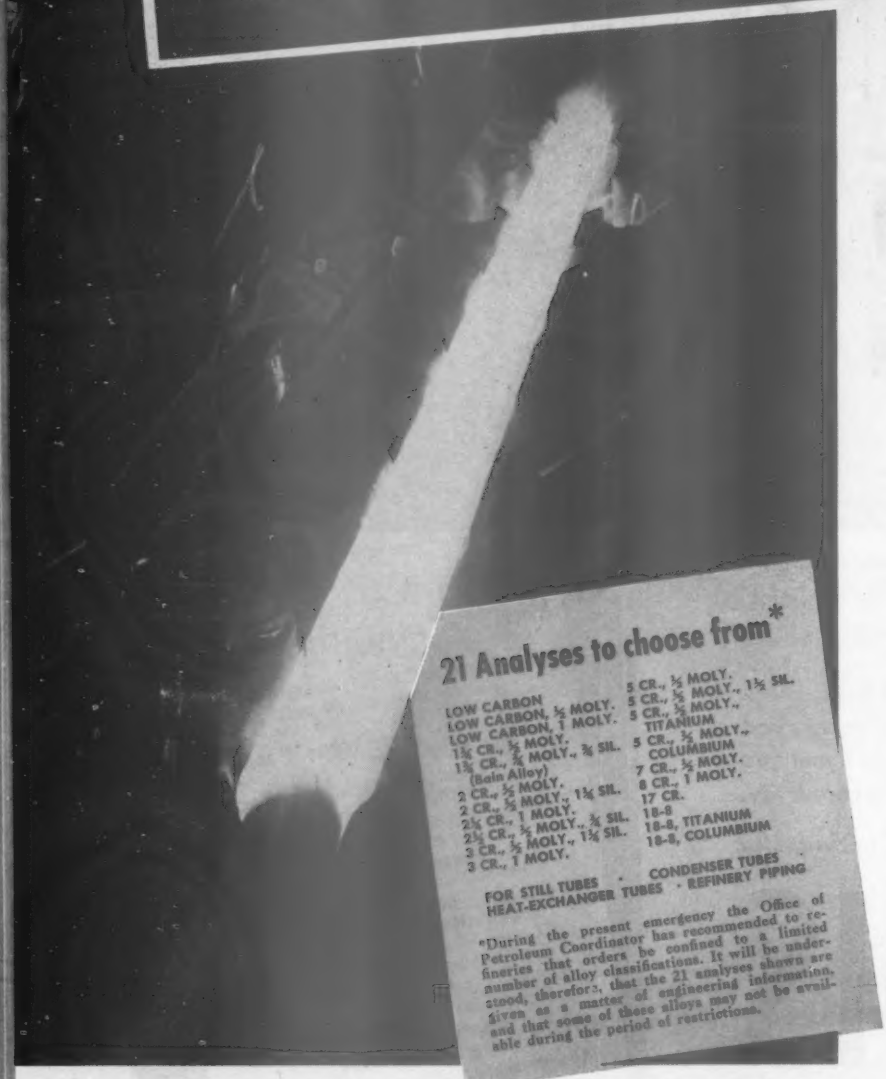
THREADING MACHINERY—THREAD CUTTING DIE HEADS—COLLAPSIBLE TAPS

REPRESENTED IN THE DOMESTIC OIL FIELDS BY:

Colcord-Wright Machinery & Supply Co., St. Louis, Mo.; C. J. Harter Machinery, Houston, Texas: Frederic-Baker Co., New Orleans, La.; Moore Machinery Co., Los Angeles and San Francisco, Calif.; Hendrie & Bolthoff Mfg. & Supply Co., Denver, Colo.

Already on the Job!

NATIONAL TUBING FOR SYNTHETIC RUBBER PROCESSING


21 Analyses to choose from*
LOW CARBON
LOW CARBON, ½ MOLY.
LOW CARBON, 1 MOLY.
1¼ CR., ½ MOLY.
1¼ CR., ½ MOLY., ⅜ SIL. (Bain Alloy)
2 CR., ½ MOLY.
2 CR., ½ MOLY., 1¼ SIL.
2 CR., 1 MOLY.
2½ CR., ½ MOLY., ⅜ SIL.
2½ CR., ½ MOLY., 1¾ SIL.
3 CR., ½ MOLY.
3 CR., 1 MOLY.
5 CR., ½ MOLY.
5 CR., ½ MOLY., 1½ SIL.
5 CR., ½ MOLY., TITANIUM
5 CR., ½ MOLY., COLUMBIUM
7 CR., ½ MOLY.
8 CR., 1 MOLY.
17 CR.
18-8
18-8, TITANIUM
18-8, COLUMBIUM
FOR STILL TUBES · CONDENSER TUBES
HEAT-EXCHANGER TUBES · REFINERY PIPING
*During the present emergency the Office of Petroleum Coordinator has recommended to refineries that orders be confined to a limited number of alloy classifications. It will be understood, therefore, that the 21 analyses shown are given as a matter of engineering information, and that some of these alloys may not be available during the period of restrictions.

AS might be expected of the nation's largest manufacturer of tubular products, NATIONAL Tube Company has already supplied tons and tons of seamless tubing for various types of synthetic rubber processing plants.

This problem was not wholly new to us. Our long experience in developing suitable tubing for 100-octane gasoline plants has given us an acquaintance with Butadiene and other elements found in the manufacture of synthetic rubber.

Some types of plants require regular carbon steel tubes; others require alloy steel tubes. Both are available for the war program. Our metallurgical staff is familiar with the needs and can help you make the right selection without delay.

Speed in getting the plants into operation is all important today—and that's where we are doing our best to help. Our plants are turning out large quantities of tubing in the shortest possible time once they get the go-ahead.

Send for New Book

Our new book entitled "Technical Data for Refineries" gives specifications and properties of each type of steel tube needed for the industry. You can find a world of information on properties at elevated temperatures, corrosion resistance, forging properties, welding practices and the most important applications. It also contains a chart showing comparison of the various types of steel for chromium content, relative cost, tensile strength, creep stress, oxidation susceptibility, Brinell hardness and lineal thermal expansion. Send for a copy today.

TUBES BY THE TON. NATIONAL TUBE COMPANY *is already deep in the production of seamless steel tubes for all types of synthetic rubber processing plants. Take advantage of this "know how" to save time in making proper tube selection.*

NATIONAL TUBE COMPANY

PITTSBURGH, PA.

Columbia Steel Company, San Francisco, *Pacific Coast Distributors* · United States Steel Export Company, New York

UNITED STATES STEEL

EDWARD FORGED STEEL RELIEF VALVES *Stand Guard*

LIKE ALL valves in the Edward line, Edward relief valves are simple, functional and sturdy in design. There are only a few parts, all precision-built to withstand severe service. Body is forged steel, bonnet rolled steel. Renewable stainless steel seat and accurately ground stainless steel ball disk for tight seating. Rolled steel screw cap is vapor proof. Fine carbon steel spring of adequate length for full relief area when discharging.

Size—Fig. 141	Dimensions in Inches		Weight, Lb.
	Center to end	Center to top	
¼ & ⅜	1½	6½	2½
½	1⅞	7¾	4¾
¾	2⅛	9½	6¼
1	2⅜	10	13
1¼	2¾	12¼	19½
1½	3⅛	14¼	30½
2	3¾	16	40

INQUIRIES should include information concerning service, frequency of operation and relieving pressure desired. For additional details on relief valves and other cast and forged steel valves in the Edward line write for Edward **BETTER VALVES** Catalog No. 101.

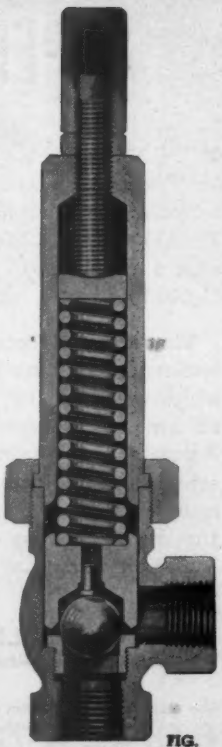


FIG. 141

TO PROTECT EQUIPMENT against abnormal increase in pressure, choose Edward steel relief valves.

Built in ¼ in. to 2 in. sizes, Edward relief valves are widely used in power, marine, chemical process, petroleum, refining, hydraulic and general industrial service.

Edward relief valves withstand heat as well as pressure. Design of adjusting mechanism and length and generous proportions of spring makes close pressure relief regulation possible.

THE EDWARD VALVE & MFG. CO., INC.
1492 West 145th Street
EAST CHICAGO, INDIANA

EDWARD *Steel* VALVES
CAST AND FORGED

Texas' Deepest Hole
DRILLED WITH LINK-BELT SUPER HYPER CHAIN

Link-Belt API 4 Super Hyper Chain

9119

● J. S. Abercrombie Company has drilled to a new record depth for Texas . . . . 14,378 feet, or 650 feet below Texas' previous record . . . . testing formations below the already deep Old Ocean Field. Drilling of McDonald B-1, the record hole, was stopped after 6 months and 2 days, to plug back for production near the 11,000 foot pay.

That's a lot of footage and a lot of drilling time, and is a genuine testimonial to Link-Belt Super Hyper Precision Rotary Chain, which was used 100% on this job. Particularly is this true since no special arrangements for extreme drilling depths were made. A derrick and rig from an offset location were merely skidded over, set up, and spudded in . . . . just the average Old Ocean drilling equipment. However, it's a well known fact in oil field circles that average drilling at Old Ocean demands the best in equipment. Link-Belt Chain has drilled more than *200 miles* of hole at Old Ocean.

LINK-BELT COMPANY

Indianapolis, Dallas, Houston, Los Angeles, Kansas City, Mo., New York, Toronto.
Distributors in all fields.

Also manufacturers of silent chain drives, roller chains, roller and ball bearings, and other transmission equipment, mud screens and cranes.

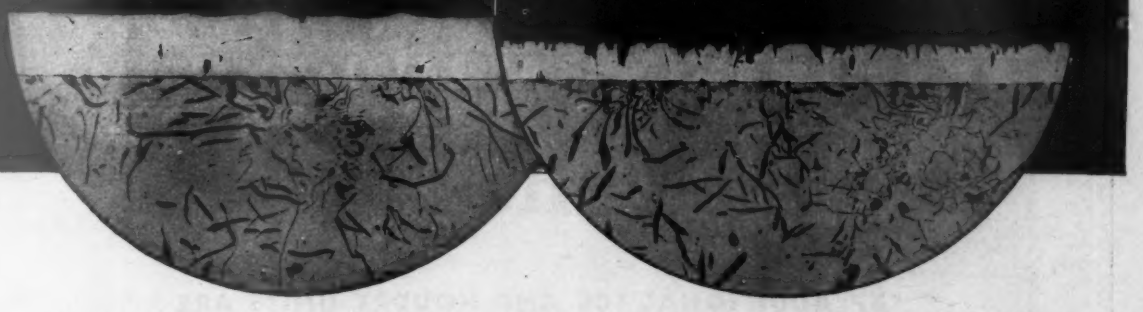
LINK-BELT CHAINS
A TYPE FOR EVERY OIL INDUSTRY SERVICE

What do we mean.

"PORUS"?

This photomicrograph, original 100x, shows a cross section of a .004" thick chromium deposit on cast iron. This is the hard, wear-resistant, KROME of PORUS-KROME. Except for minimal valleys, the surface is level and dense, affording little hold for oil.

Here you see the meaning of "PORUS". For effective lubrication, a controlled amount of "oil reservoirs" have now been created by further processing. The plateaus between "reservoirs" have been honed to provide a true bearing surface.



PORUS-KROME is the precision application of hard chromium, having controlled porosity and smoothness, to internal combustion engine cylinder bores and other bearing surfaces. The improved lubrication plus low friction adds greatly to both life and efficiency by decreasing corrosion and abrasion.

Longer engine life and improved performance are attested by outstandingly successful results in exacting tests and in engines in actual service.

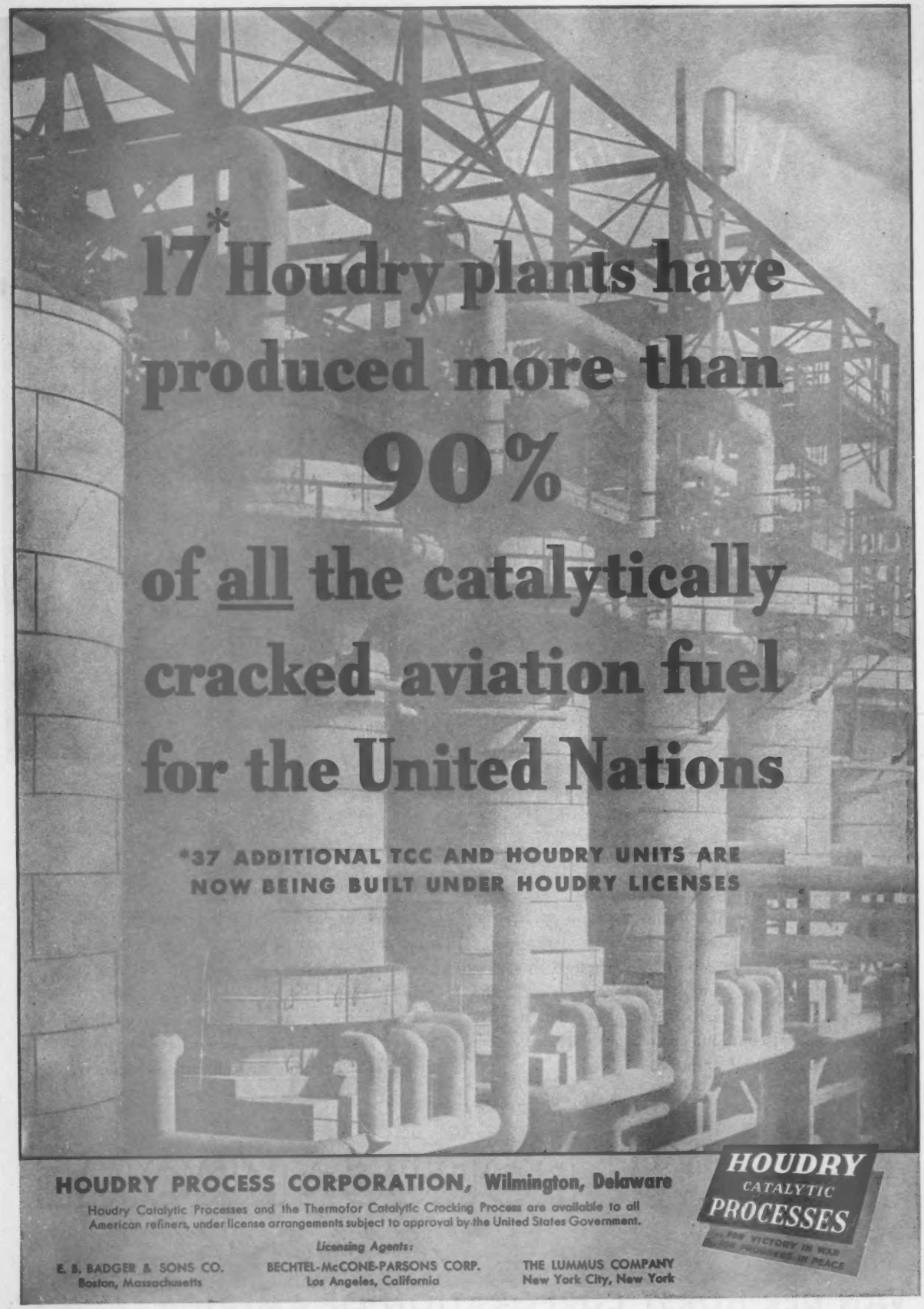
Our experience and methods in the application of PORUS-KROME may interest you as they pertain to your own problems and products.

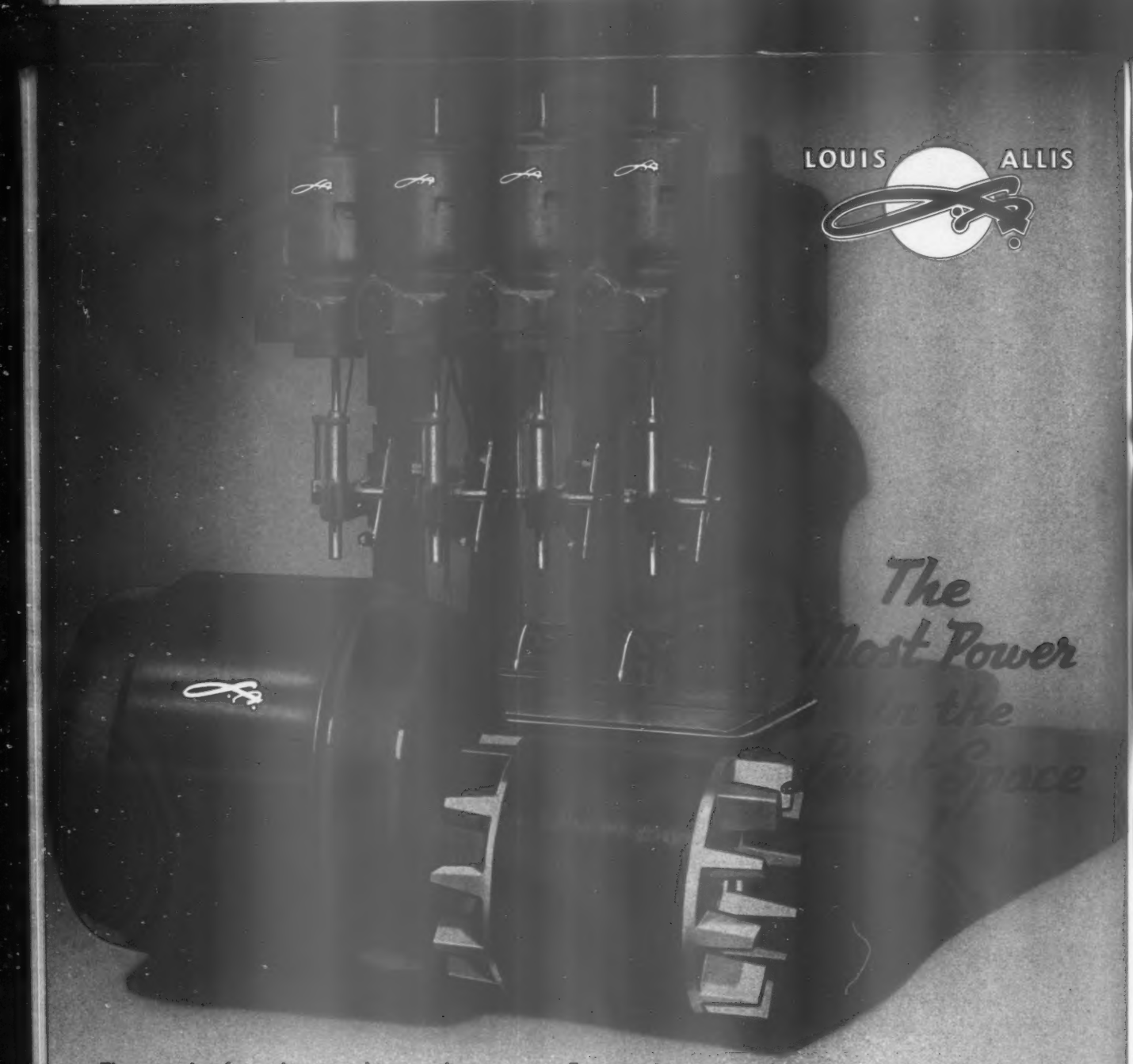
VAN DER HORST

PORUS ☆ KROME

Multiplies Engine Life

VAN DER HORST CORPORATION OF AMERICA CLEVELAND, O. OLEAN, N. Y.


17* Houdry plants have
produced more than
90%
of all the catalytically
cracked aviation fuel
for the United Nations
*37 ADDITIONAL TCC AND HOUDRY UNITS ARE
NOW BEING BUILT UNDER HOUDRY LICENSES
HOUDRY PROCESS CORPORATION, Wilmington, Delaware
Houdry Catalytic Processes and the Thermofor Catalytic Cracking Process are available to all
American refiners, under license arrangements subject to approval by the United States Government.
Licensing Agents:
E. B. BADGER & SONS CO.
Boston, Massachusetts
BECHTEL-McCONE-PARSONS CORP.
Los Angeles, California
THE LUMMUS COMPANY
New York City, New York
HOUDRY
CATALYTIC
PROCESSES
FOR VICTORY IN WAR
FOR PROGRESS IN PEACE



The trend of modern machinery design is towards greater use of built-in rolled shell shaftless type electric motors.

Direct motor drive of different operating parts of a machine permits the application of motors with exactly the proper electrical characteristics for each drive. This eliminates costly and complicated mechanical transmission of power from one part of the machine to another.

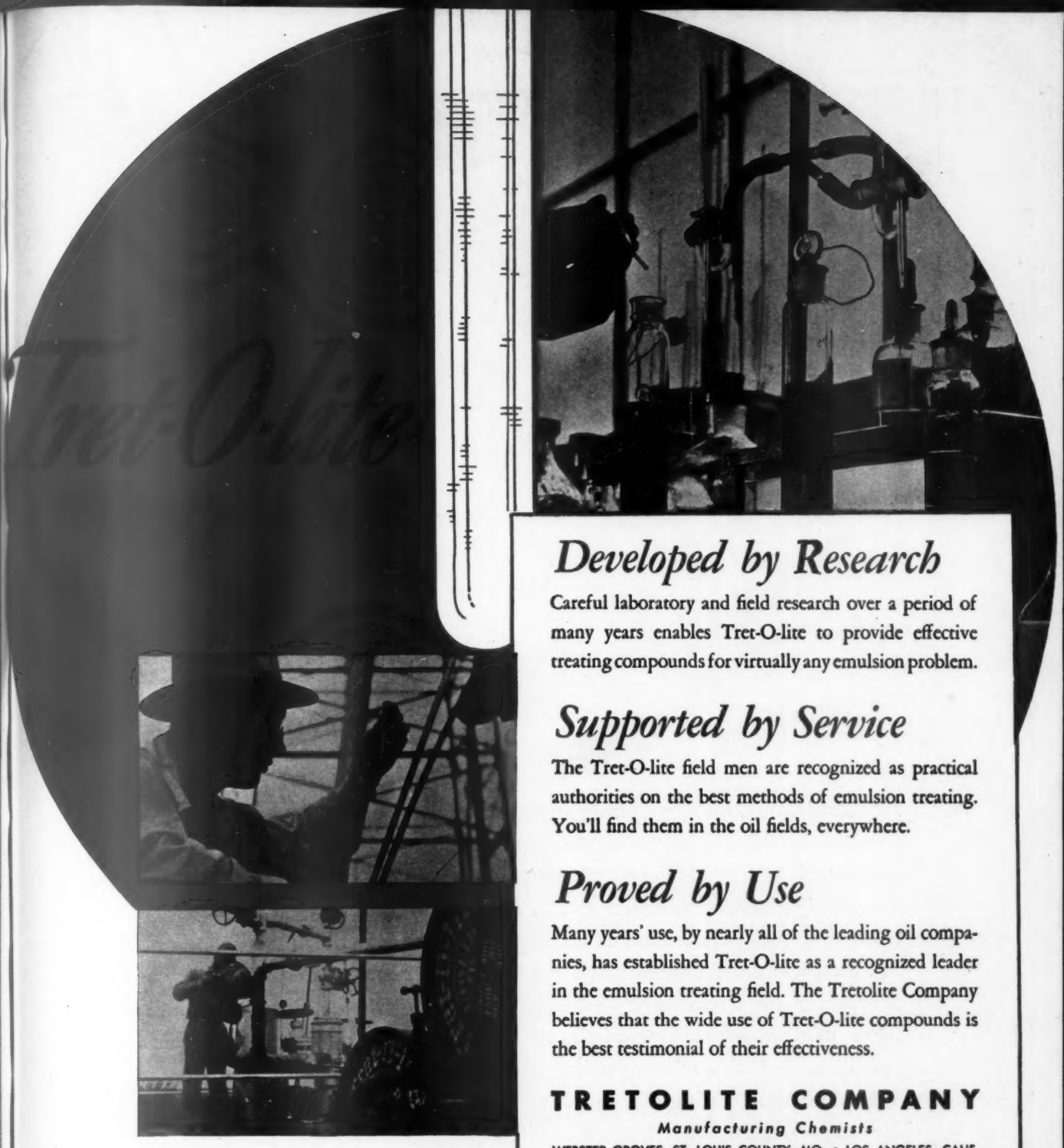
A wide range of electrical characteristics and dimensions for each horsepower rating—permits a greater flexibility in designing machinery.

For over 40 years we have been working hand in hand with machinery designers—helping to make good machinery better—by the proper application of the proper motors.

We earnestly solicit your inquiry on your very next electric motor requirement—and assure you that your needs will receive our most prompt and careful attention in every way.

A copy of our Bulletin No. 516C, describing shaftless motors and their application will be cheerfully sent upon your request.

THE LOUIS ALLIS CO., MILWAUKEE, WIS.



Developed by Research

Careful laboratory and field research over a period of many years enables Tret-O-lite to provide effective treating compounds for virtually any emulsion problem.

Supported by Service

The Tret-O-lite field men are recognized as practical authorities on the best methods of emulsion treating. You'll find them in the oil fields, everywhere.

Proved by Use

Many years' use, by nearly all of the leading oil companies, has established Tret-O-lite as a recognized leader in the emulsion treating field. The Tretolite Company believes that the wide use of Tret-O-lite compounds is the best testimonial of their effectiveness.

TRETOLITE COMPANY

Manufacturing Chemists

WEBSTER GROVES, ST. LOUIS COUNTY, MO. • LOS ANGELES, CALIF.

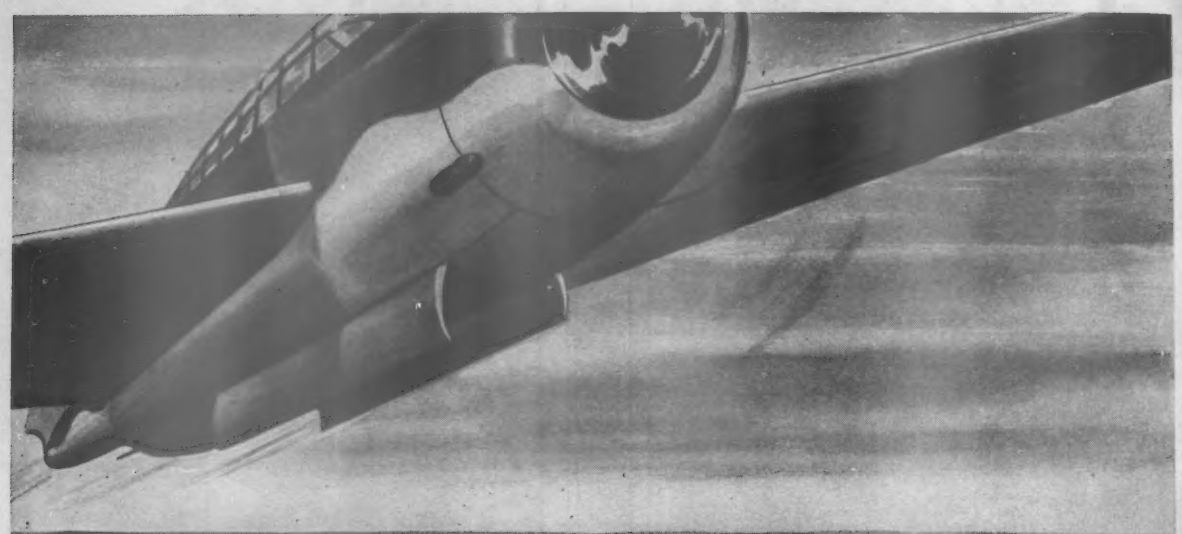
Complete Service for Every Field

Oil is Ammunition • Treat it Right

Tret-O-lite

REG. U. S. PAT. OFF.

DEHYDRATING **DESALTING**



"Tin Fish"..

Globe Steel Tubes Help to Make This Deadly Weapon of Modern War

Less than 20 ft. long, weighing approximately a ton, the deadly giant "tin fish" torpedo can blast a $60,000,000 battleship into jumbled scrap. . . . Within its cylindrical steel walls are 5,222 parts — 1225 different assemblies — for propulsion, navigation and destruction. . . . Some parts are machined to dimensions so close that their lubrication is accomplished with a medical hypodermic needle. . . . Seamless steel tubular parts for these most complicated and deadly devices of warfare are produced at Globe Steel Tubes. . . . Globe ability to produce steel tubes of exacting characteristics is effectively helping to perfect this most complicated device of destruction.

We salute the fighting courage of the torpedo plane squadrons who so skillfully drop "tin-fish" from the sky to hasten Allied Victory.

GLOBE TUBES

★ STAINLESS TUBES
★ BOILER TUBES
★ GLOBEIRON TUBING
★ GLOWELD TUBES
★ CONDENSER AND HEAT EXCHANGER TUBES
★ MECHANICAL TUBING

GLOBE STEEL Tubes

GLOBE STEEL TUBES CO., Milwaukee, Wisconsin, U.S.A.

Get pump barrels that are

One of Fl… manufacture is an exclusive … produced one-piece barrel … measurements shown in the …

	Brinnell	Rockwell
Flupaco Hardened and Honed Pumps	627	64 to 70-C
Untreated Steel Pumps	150 to 170	6 to 14-C

"GROOVE SEALS" are unmatched for maximum low-cost production

TO PRODUCE a pump that will outperform others in the same price class is, in itself, an important accomplishment. But to produce a pump that actually outperforms pumps selling at a much *higher* price is a real achievement.

Yet that's exactly what we have done in the new Flupaco "Hardened and Honed Groove Seals." What's more, "Groove Seals" are not just one-condition, one-depth pumps. They handle *any* job in the field where an insert (rod) type pump can be used—regardless of type of crude, volume depth, corrosion, abrasion, etc.—and have the largest cross-sectional displacement in insert pumps.

THE VOLUME PRODUCER handles a wide range of problems such as large volumes and deep pumping, sand conditions and corrosion, light and heavy oils.

THE PRODUCER "Groove Seal" is a rod pump for medium volumes and depths. Available in types, sizes and metals to meet almost every pumping condition.

"PETROL A" PUMPS* provide lowest-cost production from stripper wells

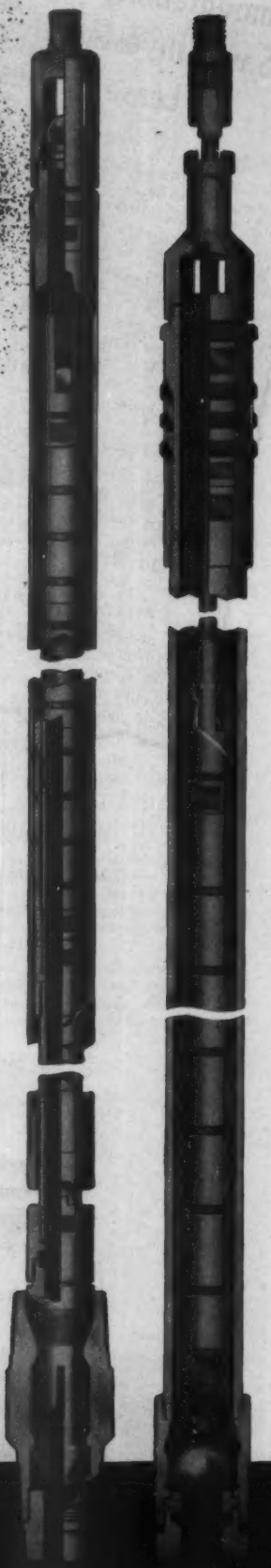
SAVING the cost of drilling new wells and making the most out of existing wells is made possible by the new, quality "Petrol A" Pumps, which can be...(1) installed at low first cost...(2) operated on minimum power... (3) depended upon for uniform production and long, trouble-free life.

"Petrol A" Pumps can be anchored to old liner barrels without pulling tubing. They can be made to run in 1½" insert tubing and are available in Top and Bottom Lock Types.

For all the advantages that you want in a stripper well pump—low first cost, low last cost, low per-barrel cost, uniform production and long life—investigate the "Petrol A" for its many benefits.

*1¾6" BORE ONLY

Fluid Packed Pump Company manufactures a complete line of oil well pumps for every installation need. Write for catalog, or contact your distributor.



Saved by "STURDYBILT"

- PREFABRICATED
- DEMOUNTABLE
- STANDARDIZED

Demountability Saves Investment In Lease Houses

OKLA. CITY, JAN. 4, 1943. On December 30 an oil company prepared to abandon its lease in the Oklahoma City Oil Field. Plans had been made to move all equipment to a lease in Kansas when they realized that no provision had been made to move two STURDYBILT lease houses.

An oil company official, knowing quick action was necessary, called the Southern Mill & Manufacturing Company, makers of STURDYBILT demountable houses, to find out if it would be possible to have both houses moved before the lease expired.

The next morning, January 1, a Southern Mill crew with four trucks, arrived on the lease to demount the houses. Two mornings later the last truck load left the lease for the new location in Kansas.

STURDYBILT demountable sectional houses, because they can be moved from one place to another, often pay for themselves by saving money that would otherwise have to be spent for new construction.

Delays in new construction, which are unavoidable now, will never occur if you own STURDYBILT demountable houses that can be moved quickly from one place to another. In a few days, these prefabricated houses can be dismantled, loaded on trucks, and moved to new locations. Upon arrival, they can be re-erected by unskilled labor.

Southern Mill & Manufacturing Company is now contributing to the war effort by supplying STURDYBILT houses to defense areas, and to war production plants. Consequently, only under certain conditions are these prefabricated houses available for use in private industry. However, prefabricated sections for maintaining STURDYBILT houses are still plentiful, and workers are available to move STURDYBILT houses for present owners.

As jobbers of Johns-Manville and Curtis woodwork products, and manufacturers of special mill work, **we can supply your needs for many types of building materials. Phone or write:**

SOUTHERN MILL & MANUFACTURING CO.

Wichita, Kansas — TULSA, OKLAHOMA — Longview, Texas

Wagner
TRANSFORMERS

★ ★ ★

POWER
DISTRIBUTION
AIR-COOLED
NOFLAMOL*
***(NON-INFLAMMABLE LIQUID FILLED)**

WAGNER
BRANCH OFFICES

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INDIANAPOLIS
KANSAS CITY
LOS ANGELES
MEMPHIS
MILWAUKEE
MINNEAPOLIS
NEW YORK
OMAHA
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PITTSBURGH
PORTLAND
ST. LOUIS
SALT LAKE CITY
SAN FRANCISCO
SEATTLE
SYRACUSE
TULSA
WASHINGTON, D.C.

In army camps, ordnance and power plants, in the oil fields, and throughout the chemical and steel industries, Wagner transformers daily demonstrate their excellence in quality. From the very beginning, the name Wagner has been *synonymous with quality.*

If you are in need of transformers to complete your war production schedules, consult the nearest of Wagner's 29 branch offices, located in principal cities and manned by trained field engineers.

Write
FOR BULLETINS
TU-33 (NOFLAMOL)
TU-181 (POWER)
TU-180 (DISTRIBUTION)

T43-4

★ ★ ★

Wagner Electric Corporation

ELECTRICAL AND AUTOMOTIVE PRODUCTS

Your Best Safeguard Against the Sabotage of Corrosion and the Elements

LET Pittsburgh Tankhide "draw the teeth" of those saboteurs. Tankhide is fortified with improved *"Vitolized Oil"* which remains in the paint film long after application . . . keeps it *Live,* tough and elastic indefinitely . . . enables it to resist cracking and peeling when the painted surface expands or contracts. For longer life and lower cost-per-year-of-service, give your storage tanks *Live-Paint Protection.* Specify Pittsburgh Tankhide.

Call on us for free advisory service at any time. You'll find that Pittsburgh technical men "speak your language"—have a thorough knowledge of the protective problems of the petroleum industry.

PITTSBURGH PLATE GLASS COMPANY
Industrial Paint Division, Pittsburgh, Pa.
Factories:
Milwaukee, Wis.; Newark, N.J.; Houston, Texas; Los Angeles, Calif.; Portland, Ore.
Ditzler Color Division, Detroit, Mich. • The Thresher Varnish Co., Dayton, O.

PITTSBURGH *Industrial* **FINISHES**
PITTSBURGH STANDS FOR QUALITY PAINT AND GLASS

There's a

20,000 FOOT WELL

in Schlumberger's

TESTING LABORATORY

Soon after originating and perfecting Electrical Well Logging, Schlumberger inaugurated a program of scientific study and research with the view of improving its sub-surface investigating technique and to develop other related processes. During the decade that followed, Schlumberger's scientists gave the industry in rapid succession a number of remarkable applications of electrical well logging, an improved gun perforator, side-wall coring, photoclinometer directional surveys and dipmeter surveys. Still other technical services are now in process of development.

Typical of Schlumberger's aggressiveness is its Houston testing laboratory whose scientific apparatus includes a well in which pressures of 12,000 lbs. p.s.i. and temperatures in excess of 300° F. are created to test the performance of Schlumberger sub-surface instruments under extreme conditions.

When 20,000' wells become a reality, Schlumberger will be ready to serve them.

SCHLUMBERGER WELL SURVEYING CORPORATION

Originators of Electrical Well Logging

THE WHEELS OF TOMORROW WILL SPEED ON MAN-MADE RUBBER

Neoprene, a product of Du Pont, being dumped from the polymerization kettle. Photo courtesy E. I. du Pont de Nemours & Co., Inc.

To the average person, production of synthetic rubber seems like a work of sheer magic. It is, in a sense . . . yet the huge, emergency-developed industry that performs this modern "miracle" requires equipment which, for magnitude and super-efficiency, is almost without parallel.

One important essential, among others, is tough, durable, dependable heat insulation, making possible the maintenance of sustained high temperatures. The selection of Carey Heat Insulation for some of the nation's largest synthetic rubber developments, is further and convincing evidence of the Carey reputation for dependable quality and successful performance.

Wherever temperatures from subzero to 2500°F. are essential, you will find efficient

Carey HEAT INSULATIONS

made to fit the job. A nationwide engineering and distribution organization is at your service. Address Dept. 34 for details.

For a Life Worth Living in the Future . . . Buy U. S. War Bonds NOW!

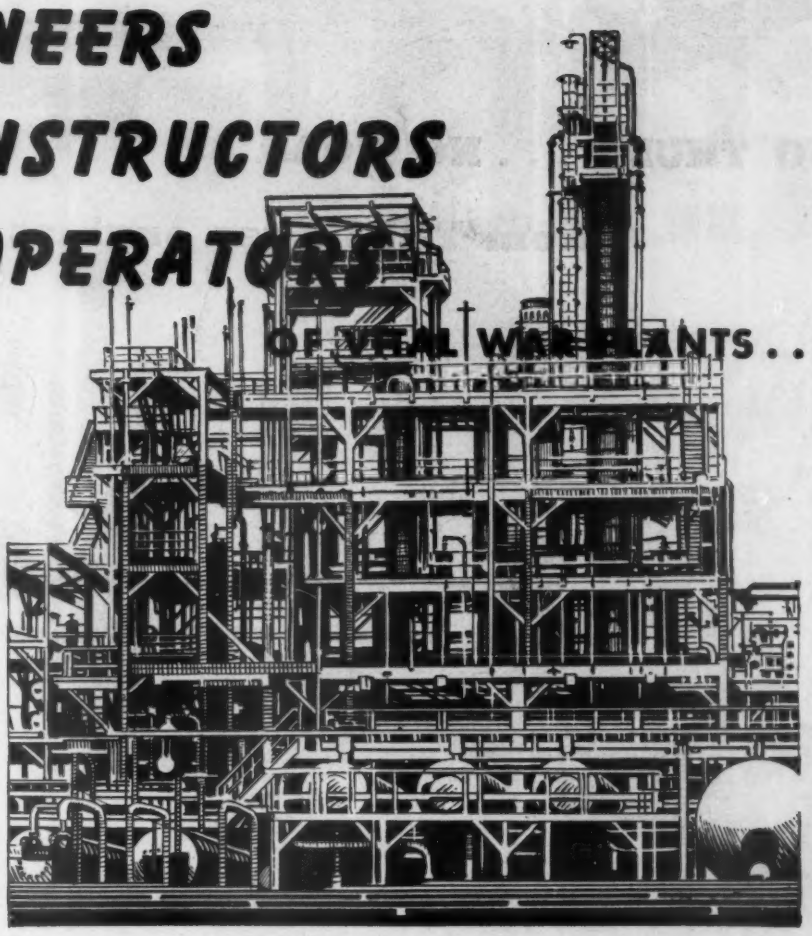
THE PHILIP CAREY MANUFACTURING COMPANY

Dependable Products Since 1873

LOCKLAND, CINCINNATI, OHIO

ENGINEERS CONSTRUCTORS OPERATORS

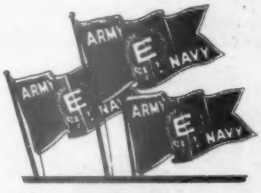
OF VITAL WAR PLANTS . . . . .



These men are doing a magnificent job in the design, erection, and operation of the all-important plants for Synthetic Rubber, High Octane Gasoline, Toluol, Synthetic Ammonia, and other war products.

Because compressors, blowers, pumps, engines, and steam jets play such an important part, we are proud that they have selected Ingersoll-Rand equipment for so many of these projects.

Their confidence is based on years of experience with the Ingersoll-Rand machines they used in their normal peace-time operations—repressuring, gasoline extraction, recycling, refining, pipe line transmission, and pumping of gases and liquids. These engineers, constructors, and operators know they can rely on I-R equipment—know of its dependability and operating economy—are sure it will stand up under 24-hour-a-day hard service required in today's total war against the Axis.



All plants of Ingersoll-Rand Company are flying the Army-Navy "E" awarded "for high achievement in the production of war materials."

Ingersoll-Rand

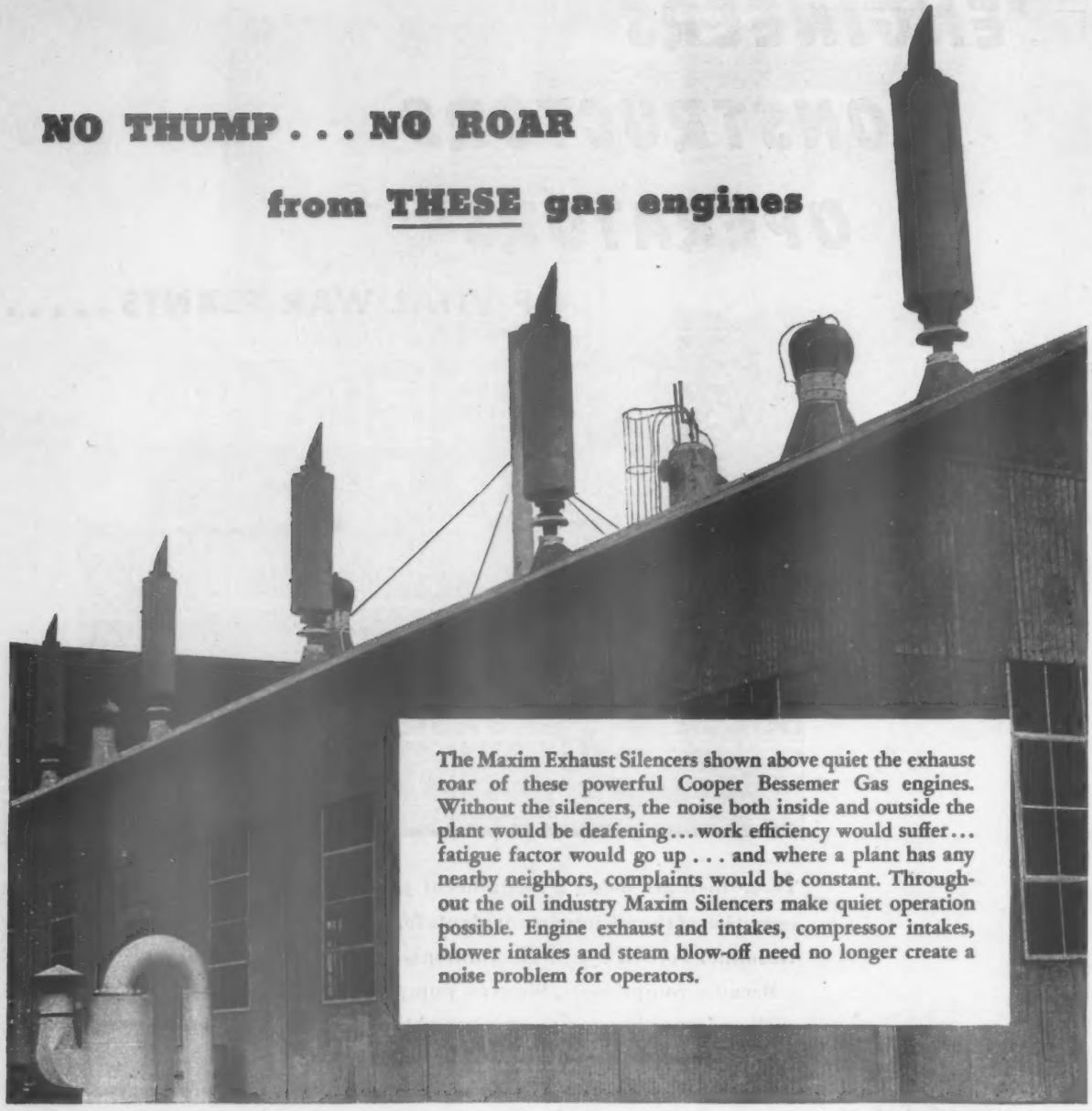
11 BROADWAY, NEW YORK, N. Y.

1-282

COMPRESSORS • TURBO BLOWERS • ROCK DRILLS • AIR TOOLS • OIL AND GAS ENGINES • CONDENSERS • CENTRIFUGAL PUMPS

NO THUMP . . . NO ROAR

from THESE gas engines



The Maxim Exhaust Silencers shown above quiet the exhaust roar of these powerful Cooper Bessemer Gas engines. Without the silencers, the noise both inside and outside the plant would be deafening... work efficiency would suffer... fatigue factor would go up . . . and where a plant has any nearby neighbors, complaints would be constant. Throughout the oil industry Maxim Silencers make quiet operation possible. Engine exhaust and intakes, compressor intakes, blower intakes and steam blow-off need no longer create a noise problem for operators.

MAXIM WASTE HEAT UNITS combine silencing with the conservation of waste exhaust heat to produce steam or hot water. Bulletins WH-100 and WH-103 on request. The Maxim Silencer Co., 98 Homestead Ave., Hartford, Conn.

MAXIM

SILENCERS and SPARK ARRESTORS

"You said it, brother—EVERYTHING!"

His job is *welding;* not fooling around getting ready to weld.

He can put more time on actual welding when he uses WeldELLS:*

—Because their tangents make them easier to line up.

—Because their precision quarter-marked ends simplify layout.

—Because the size and thickness are permanently marked on every fitting.

He can turn out a better job, too, when he uses WeldELLS—thanks to their dimensional accuracy and to the machine tool beveled ends that provide an ideal welding surface.

And the features that mean so much to the welder are also vitally important to the men who engineer the job and those who live with it.

★ No other fittings for pipe welding combine these features found in WeldELLS:

- **Seamless** — greater strength and uniformity.
- **Tangents** — keep weld away from zone of highest stress — simplify lining up.
- **Precision quarter-marked ends** — simplify layout and help insure accuracy.
- **Selective reinforcement** — provides uniform strength.
- **Permanent and complete identification marking** — saves time and eliminates errors in shop and field.
- **Wall thickness never less than specification minimum** — assures full strength and long life.
- **Machine tool beveled ends** — provides best welding surface and accurate bevel and land.
- **The most complete line of Welding Fittings and Forged Steel Flanges in the World** — insures complete service and undivided responsibility.

* WeldELLS and many other Taylor Forge products are produced in Byers Genuine Wrought Iron.

TAYLOR FORGE & PIPE WORKS, General Offices & Works: Chicago, P. O. Box 485

* The list of Taylor Forge's contributions to the war effort only begins with WeldELLS. One of many examples is Taylor Corrugated Marine Furnaces, essential to many merchant ships and transports.

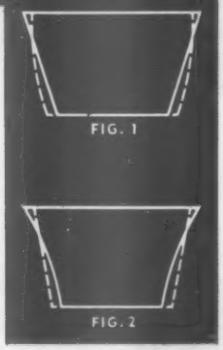
NEW YORK OFFICE: 50 CHURCH ST. • PHILADELPHIA OFFICE: BROAD ST. STATION BUILDING

Here's *Why* V-Belts with the

CONCAVE SIDE

Give Better Service . . . Longer Wear

What Happens When a V-Belt Bends



436

If you want longer belt wear and greater efficiency in your V-belt drives, make this simple test:

Take *any* V-Belt that has *straight* sides. Bend that belt as it will bend in going around its pulley. As the belt bends, grip its sides firmly between your fingers and thumb. You will *feel* the sides of the belt *bulge out* —as shown in figure 1 on the right.

Now look at figure 2. There you see what happens when you bend a belt that is built with the patented *concave* side. By building the side *concave,* the bulge has been *taken out* of this belt *to begin with.* When this belt bends, the sides become *perfectly straight* and the shape of the belt *exactly fits* its sheave groove. Two savings result:—

First:—With no outbulge of the sides, the *full width* of the belt *uniformly* grips the sheave-groove wall. This means *uniform wear—longer life!* Second:—Exact fit in the sheave groove gives the belt a *firmer hold* which carries heavier loads without slippage. This again saves belt wear—gives a steadier, more efficient drive operation.

Only V-belts built by Gates are built with the Concave Side, a Gates patent.

THE GATES RUBBER COMPANY

Engineering Offices and Stocks in All Large Industrial Centers

GATES VULCO ROPE DRIVES

CHICAGO, ILL. 549 West Washington
NEW YORK CITY 215-219 Fourth Avenue
ATLANTA, GA. 738 C. & S. National Bank Building
LOS ANGELES, CAL. 2240 East Washington Boulevard
DENVER, COLO. 999 South Broadway
DALLAS, TEXAS 2213 Griffin Street
PORTLAND, ORE. 333 N. W. 5th Avenue
SAN FRANCISCO, CAL. 1090 Bryant Street

Keep 'em Clean WITH A-C UNITS

An oil well that needs servicing is contributing just as little to our fight as a tank without gasoline—and it could be the cause.

Many factors, including the hot summer weather, will enter into your being able to keep your pumping wells in good condition this year—but there is one thing certain—leases that are serviced by Allis-Chalmers Pulling Units will have the equipment to do the job.

The FOUR sizes of A-C WINCH TRACTORS permit you to select a unit that will take care of your well servicing regardless of field operating conditions, size of field, or depths of wells. Models L, E, M, and W are available with Double Drums and ALL models can be equipped with cleaning-out equipment, rotary drive and telescoping mast.

A-C Model M Winch Tractor

Speed that takes machine and crew to a well in a hurry, either 15 or 30 m.p.h. maximum road speeds. The unit will easily service wells with 5,000' of 2½" tubing. **Maximum line pull 32,600 lbs., engine torque is 200 ft. lbs.**

Winch Drum has EIGHT line speeds to 1,050' p.m. at 1,400 engine r.p.m. Winch is equipped with Cooper, patented, Circulating Air-Cooled Brakes. Engine operates on butane, natural gas, gasoline or distillate.

Write for complete specifications.

STAYNEW FILTERS

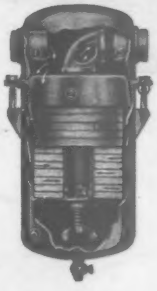
What Does the Name "STAYNEW" Mean? » » » » » » »

1. Less Wear on Engines and Compressors
2. More Service from Air-Powered Tools
3. Longer Lasting Filters

ENGINE AND EQUIPMENT SAVING FILTERS FOR THE OIL INDUSTRY

FOR ENGINE & COMPRESSOR PROTECTION

Models D, DS: Permit only clean, dust-free air to be drawn into engine and compressor intake. Feltex Filtering Medium (B) in Radial Fin Construction (C) provides greatest possible filtering area and efficiency with continued low restriction to air flow. (A) Silencing Chamber (Model Frame; (E) Reinforcing tube. D and DS Protectomotors make new engines and compressors *stay new*—add to life and efficiency of old ones.



NEW "SUPER" FILTER

Models AAPH, AAPHS: A newly designed Staynew filter that removes the slightest traces of oil from air transmission lines. Widely used as a final stage in the protection of delicate control instruments. (1) Inlet; (2) Baffle; (3) Solid Feltex discs through which all air must pass; (4) Perforated Liner; (5) Outlet; (6) Shell; (7) Drain Cock; (8) Swing Bolts (Model AAPHS only) for easy inspection.

FOR COMPRESSED AIR & GAS LINES

Models CP, CPH: Thousands in use throughout the oil industry. Guaranteed delivery of clean, dry air, free from dust, dirt, pipe-scale, rust, water — air-powered tools operate more efficiently, last longer. Like all Staynew and Protectomotor filters—easy to inspect, easy to clean, low restriction to air flow, long lasting. Models for horizontal and vertical installation. (1) Container; (2) Baffle; (3) Insert Housing; (4) Filter Insert in Radial Fin Construction; (5) Drain Cock.

Representatives in Principal Cities

Get the Entire Story!

Find out about Staynew and Protectomotor engine and equipment-saving features: Radial Fin Construction—Feltex and Glastex Filtering Mediums—*Double* Counter-clockwise Rotating Curtains—Fire-resisiant Wire Kladding, etc.

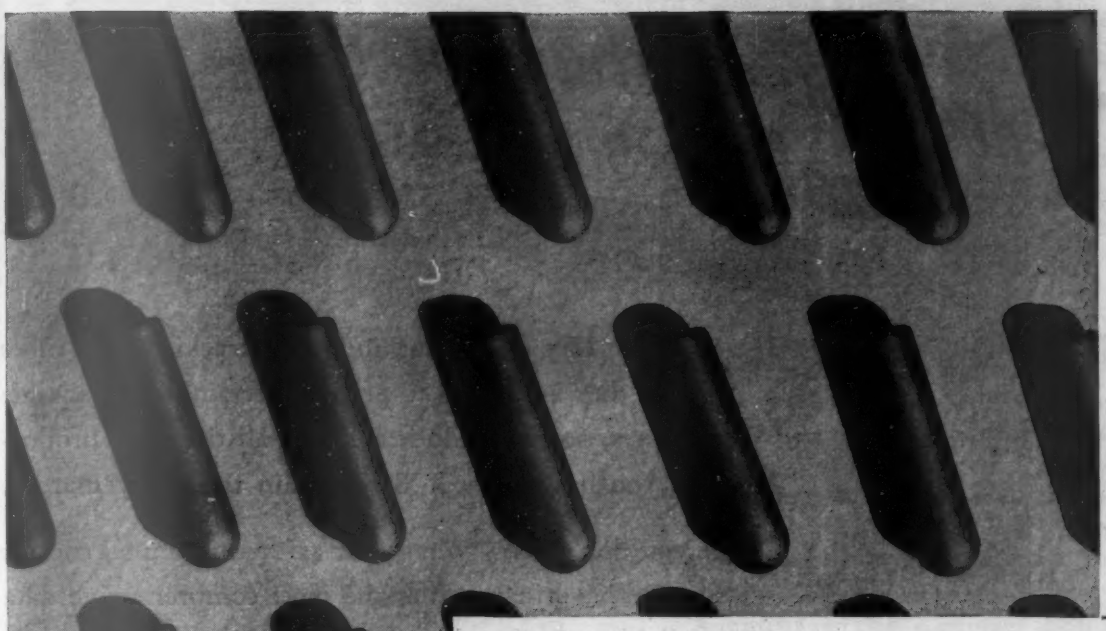
Catalog describes entire line, including filters for building ventilation.

WRITE FOR COMPLETE CATALOG

PROTECTOMOTOR 99 10 Per Cent EFFICIENT AIR FILTERS

STAYNEW FILTER CORP.

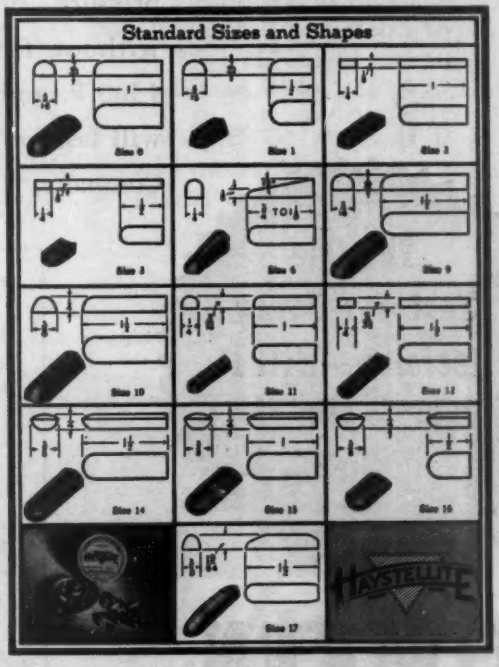
5 Centre Park, Rochester, N. Y. *"Filter Headquarters"*



HAYSTELLITE INSERTS
reduce drilling costs

Good bits, correctly set with Haystellite inserts and faced with Haystellite tube rod, assure maximum round-trip footage of out-to-gauge hole.

There Is a Size and Style of Haystellite Insert for Every Type of Drilling Bit



Haystellite cast tungsten carbide inserts are available in thirteen standard sizes and shapes. One type is shown here, actual size.

The word "Haystellite" is a registered trade-mark of Haynes Stellite Company.

HAYNES STELLITE COMPANY
Unit of Union Carbide and Carbon Corporation

New York, N. Y. UCC Kokomo, Ind.

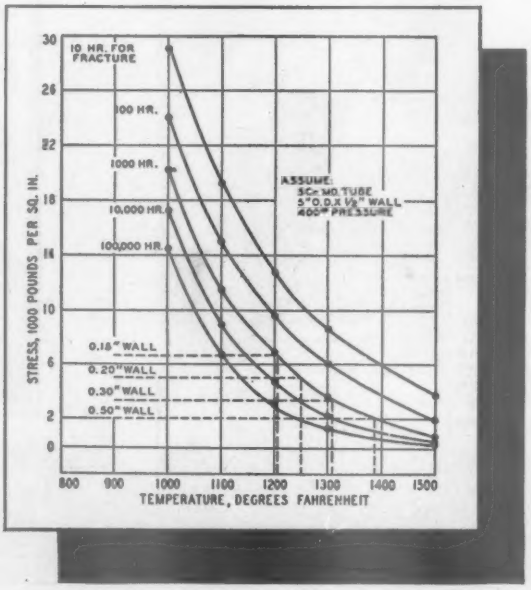
Chicago, Cleveland, Detroit, Houston, Los Angeles, San Francisco, Tulsa

Are you overheating your cracking still tubes?

If you are pushing your cracking still tubes for all they are worth to produce certain new war-time products, don't overdo it and lose all the extra production you have gained. Stay within the safety margin.

If you don't know what your safety margin is, consult us. We have in our files the most comprehensive data available on tubes for high temperature service.

For instance, a glance at this Timken Stress-Rupture Chart, plotted for 5 CrMo steel tells you that a 5 CrMo steel tube five inches in diameter with a one-half inch wall, operating under 400 pounds pressure, can be heated to 1375°F. for 1000 hours without fracture. If the temperature is held to 1300°F. and the pressure remains the same, this tube will last for 10,000 hours. The Timken Roller Bearing Company, Canton, Ohio. Steel and Tube Division.



TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

SEAMLESS STEEL TUBES

LUBE OIL PRODUCTION INCREASED 60%

AND NO NEW EQUIPMENT REQUIRED

A Mid-Continent refinery was swamped with rush orders for high quality specification lube oil. These specifications slowed down plant production to less than normal, and even so, barely met quality. The situation called for quick action to meet war-time demands.

A Filtrol service engineer studied the problem. Changes were made in the acid treating procedure and contacting technique and the use of Super Filtrol was instituted. The result: improved quality of the oil to specification *plus* and stepped up production to 160% of the normal plant capacity. The economy effected amounted to more than the total cost of the clay originally used, and the rush orders were filled.

This is but one of the many production-increasing jobs Super Filtrol is doing to get more and better oil —oil that is the ammunition needed to help America win this war. Why not let Filtrol Service help you?

FILTROL CORPORATION
General Offices: 634 S. Spring St., Los Angeles, California
Plants: Vernon, California Jackson, Mississippi

Super **FILTROL**

THE ACTIVATED AGENT SPEEDS PRODUCTION, CONSERVES MATERIALS

BAASH ROSS TOOL CO.

Baash-Ross News

BAASH-ROSS TOOL COMPANY · LOS ANGELES · HOUSTON · NEW YORK

OIL & GAS JOURNAL EDITION

How to keep a safeguard SAFE

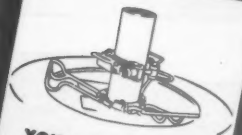
MANY OPERATORS tell us that one of the best all-around investments they ever made in rig equipment is the Baash-Ross Safety Clamp. Not only is it an ideal safeguard against dropping drill collars and other flush joint equipment down the hole, but it also is proving a valuable aid to production work and it simplifies many fishing operations. Baash-Ross Safety Clamps will be difficult to obtain for the duration. So here's how to insure long life and topmost efficiency from the Safety Clamp on *your* rig . . .

The important feature that enables the Safety Clamp to take a bull dog grip on even the smoothest case-hardened surface is the unique "sliding slip" built into each individual link. When the clamp is first tightened around the pipe these slips take a firm initial hold. Then any increase in the load causes the slips to slide up on their tapered seats and wedge tighter against the pipe, rigidly locking the clamp against movement. Because these slips must be free to slide *the instant* increased pressure is applied, the sliding surfaces must be kept clean and friction-free at all times. So don't allow rotary mud to cake on the clamp . . . nor heavy greases or dirt to collect!

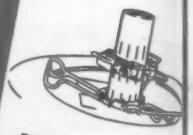
Should the sliding surfaces of the gripping members become dry, they cannot operate efficiently. . . More important—dry surfaces are apt to gall under sudden impact loads, damaging the Clamp so that repairs or replacements might be necessary. Therefore, keep the clamp well lubricated with a very light penetrating oil that won't gum or thicken!

AN EASY WAY to keep your Safety Clamp BOTH clean and properly lubricated is to fill the metal case in which you store the Clamp with a good grade of kerosene or cleaning oil. The case has been particularly designed with welded corners and a solid bottom that will not leak. Keep the Clamp immersed in the fluid when it is not in use . . . and after use be sure to flush all mud and dirt off the Clamp before returning it to the case. This will keep the fluid clean and free of grit.
That's about all the maintenance your Safety Clamp requires . . . but it is vitally important maintenance! Just be sure you fill the case with fluid that is light enough to have a cleaning action—yet has sufficient lubricating value to keep the surfaces oiled. Either kerosene or light flushing oil will prove satisfactory!

ARE YOU GETTING FULL SERVICE FROM YOUR BAASH-ROSS SAFETY C

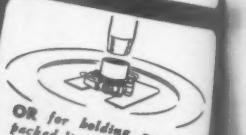


YOU probably are already using your Safety Clamp to safeguard against dropping drill collars in the hole while making them up or breaking them out of the string . . .



BUT have you tried using it to safeguard against dropping other types of flush surfaced equipment such as flush joint drill strings, liners and screens?

OR as an emergency elevator shoulder when recovering twist-offs and similar fish? One operator safely supported a 4000' drill string this way while lifting it far enough to get a collar in the clear!



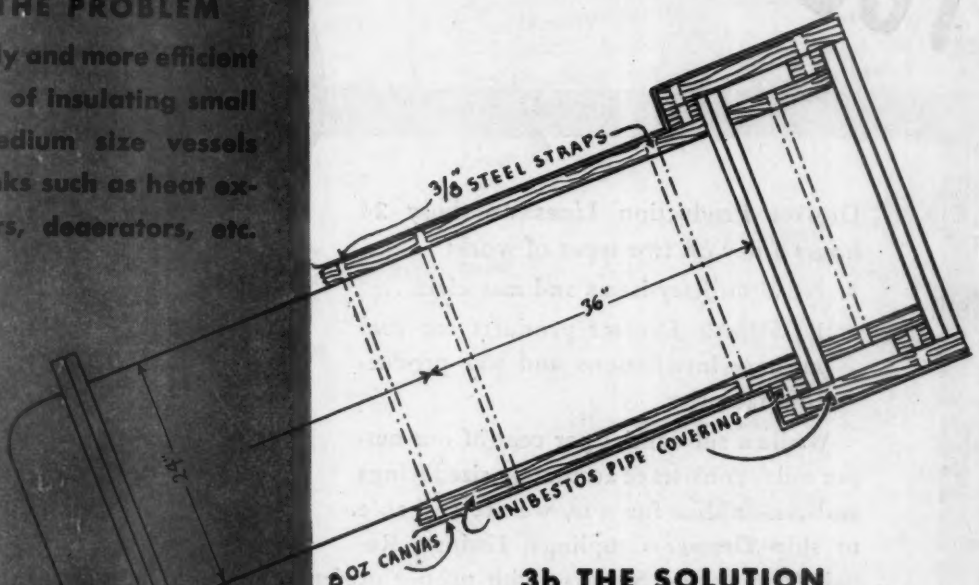
OR for holding gravel-packed liners in the table while making them up? These liners usually have insufficient room between collar and pack for elevators. So put the Clamp in this space and support the liner through a "U" plate on the table. Gives ample room for tongs!

This is the 3rd in a series of messages

DEALING WITH THE PROBLEMS IN HEAT INSULATION FACED BY ENGINEERS AND SOLVED BY USING UNARCO unibestos

3a THE PROBLEM

A speedy and more efficient method of insulating small and medium size vessels and tanks such as heat exchangers, deaerators, etc.



3b THE SOLUTION

Application of Unibestos in single layer construction, in a combination of standard and super material, of half or quarter sections. This will eliminate the costly and time-consuming method of banding on individual layers in segmental form. Unibestos is applied in large size sections making a quick, easier, more efficient application.

UNIBESTOS is available in Standard material, for temperatures up to 750°; Super, with a temperature limit of 1200°; Combination, with a temperature limit of 1200°. These temperature limits permit the use of one material at maximum efficiency for a wide range of purposes. Unibestos is available in half sections up to 30" pipe diameter and from 32" to 60" in quadrants from ¾" to 5' in thickness. Standard and Super are available in single layer construction with provision for expansion in piping, where required.

INSULATION FOR MARINE, RAILROAD, AVIATION AND INDUSTRIAL USE

TWO ARMY-NAVY "E" AWARDS FOR EXCELLENCE IN WAR PRODUCTION ONE TO THE CICERO, ILLINOIS PLANT; ONE TO THE PATERSON, N. J. PLANT

UNION ASBESTOS & RUBBER CO.

GENERAL OFFICES: 1821 SOUTH 54th AVENUE, CICERO, ILLINOIS • NEW YORK • SAN FRANCISCO • PATERSON, N. J.

"Chances are— YOU CAN STILL GET THEM"

Dresser Production Lines are busy 24 hours a day on two types of work:

1. NEW military items and materials.
2. REGULAR Dresser products for *both* military installations and war production factories.

While a substantial per cent of our output today consists of accurately-sized Rings and Assemblies for war, we are still able to ship Dresser Couplings, Fittings, Repair Clamps and Sleeves (with proper preference ratings, of course) to gas and oil companies and to private and municipal waterworks for necessary pipe-joining and repair work.

When, therefore, you need Dresser products to maintain essential services, write or wire us. We cannot say as we did in the old days, "Come and get them," but we are happy to say, "Chances are you can still get them."

In cases of emergencies, Dresser Service, as always, is on a day-and-night basis, and the telephone is still—Bradford 3131.

DRESSER

MANUFACTURING COMPANY

BRADFORD, PENNSYLVANIA

A LESSON IN WATER COOLING

LESSON 5 OF A SERIES

CONCRETE WATER BASINS FOR COOLING TOWERS

The water basin beneath a cooling tower in the majority of cases also acts as its foundation. Before the design of the basin is started a loading schedule giving the reactions imposed by the superstructure and also a general outline drawing giving principal dimensions, location of columns with corresponding anchor bolt layout must be obtained from the cooling tower manufacturer.

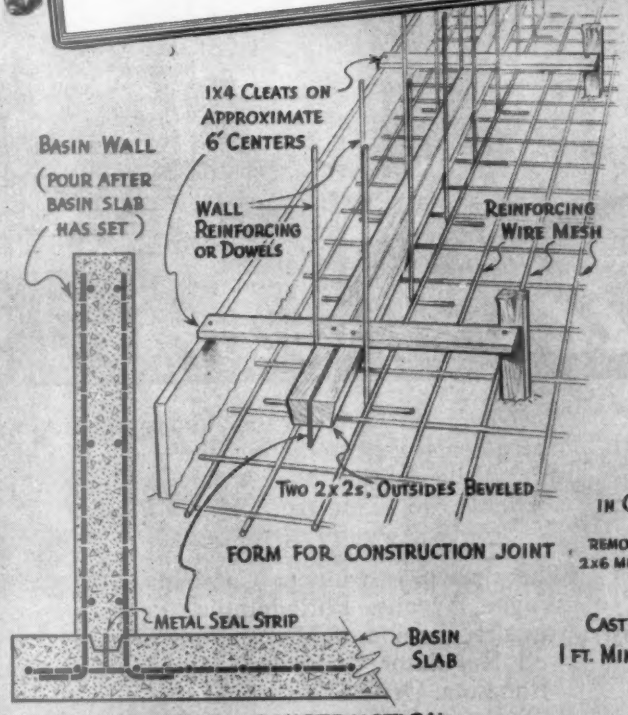
The design details, such as slab and wall thickness, amount of reinforcing and the proportions of concrete mix, should follow established practice, taking into consideration all stresses imposed and the fact that the structure is to be water tight.

Expansion joints are generally omitted in the small and medium sized basins where any expansion and contraction is not confined by adjacent structures or connecting equipment.

The bottom slab of the basin should be placed below frost line. The top of the basin walls should extend a minimum of one foot and preferably more. The total depth of the basin should make ample allowance for proper storage, a variable water level and some free board.

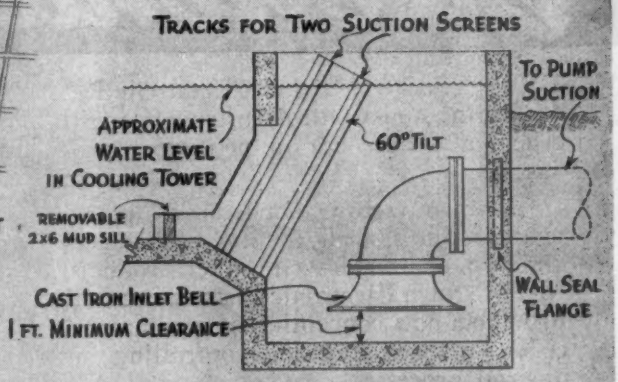
The design should provide for an overflow, drains, suction sump, screens and, if desirable, partitions for cleaning and proper operation.

The cooling tower manufacturer and the purchaser should cooperate freely to assure a basin and foundation that is suitably designed for the service as well as properly constructed.


1x4 Cleats on Approximate 6' Centers
Basin Wall (Pour After Basin Slab Has Set)
Wall Reinforcing or Dowels
Reinforcing Wire Mesh
Two 2x2s, Outsides Beveled
Form for Construction Joint
Metal Seal Strip
Basin Slab

RECOMMENDED CONSTRUCTION JOINT AND WATERSEAL

MARLEY ENGINEERS FURNISH ALL NECESSARY DESIGN DETAILS AND ENGINEERING DATA FOR BASINS, FOUNDATIONS, ETC.



RECOMMENDED SUMP AND SCREENING ARRANGEMENT

MARLEY COOLING TOWERS

THE MARLEY COMPANY INC. KANSAS CITY, KANSAS

63-A

IN 194 . . ? M-H/Brown Electronic Recording and Control Instruments will usher in a new era in peacetime production.

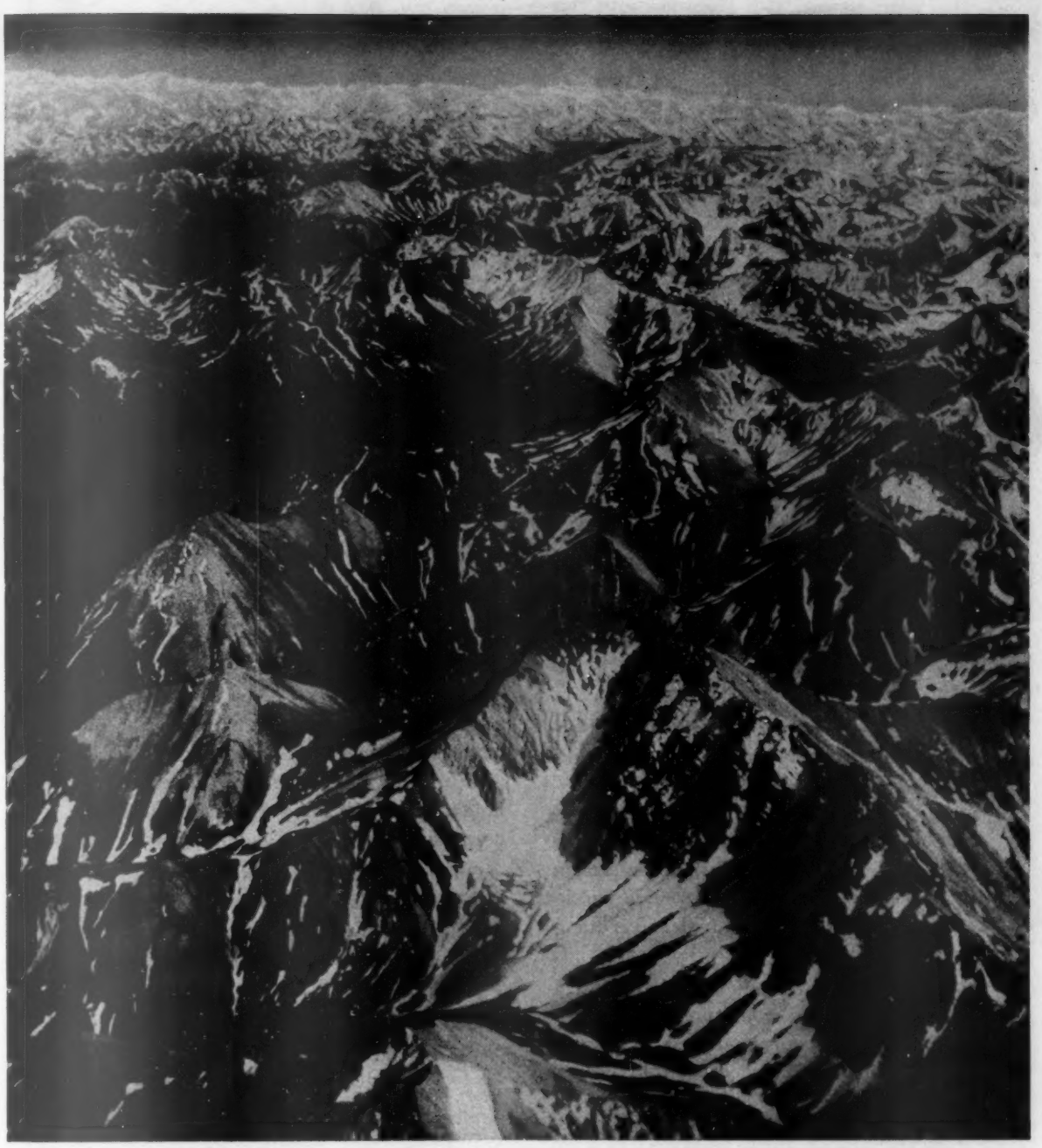
In the manufacture of chemicals, petroleum products, steels, textiles, rubber, ceramics, paper, foods—and other products, M-H/Brown Electronic Instruments will provide a new conception of greater precision in measuring and controlling industrial processes.

We are proud of the M-H/Brown background of over 100 years experience in instrument engineering which *pioneered electronic instrumentation.* Today these instruments are producing the tools of war. When peace comes they will be available to industry. *M-H/Brown Electrons are coming.*

The Brown Instrument Company, 4488 Wayne Avenue, Philadelphia, Pennsylvania, a division of Minneapolis-Honeywell Regulator Company, Minneapolis, Minnesota. Offices in all principal cities. 119 Peter Street, Toronto, Canada — Wadsworth Road, Perivale, Middlesex, England — Nybrokajen 7, Stockholm, Sweden.

Instruments by **BROWN** *and Controls by*

MINNEAPOLIS-HONEYWELL



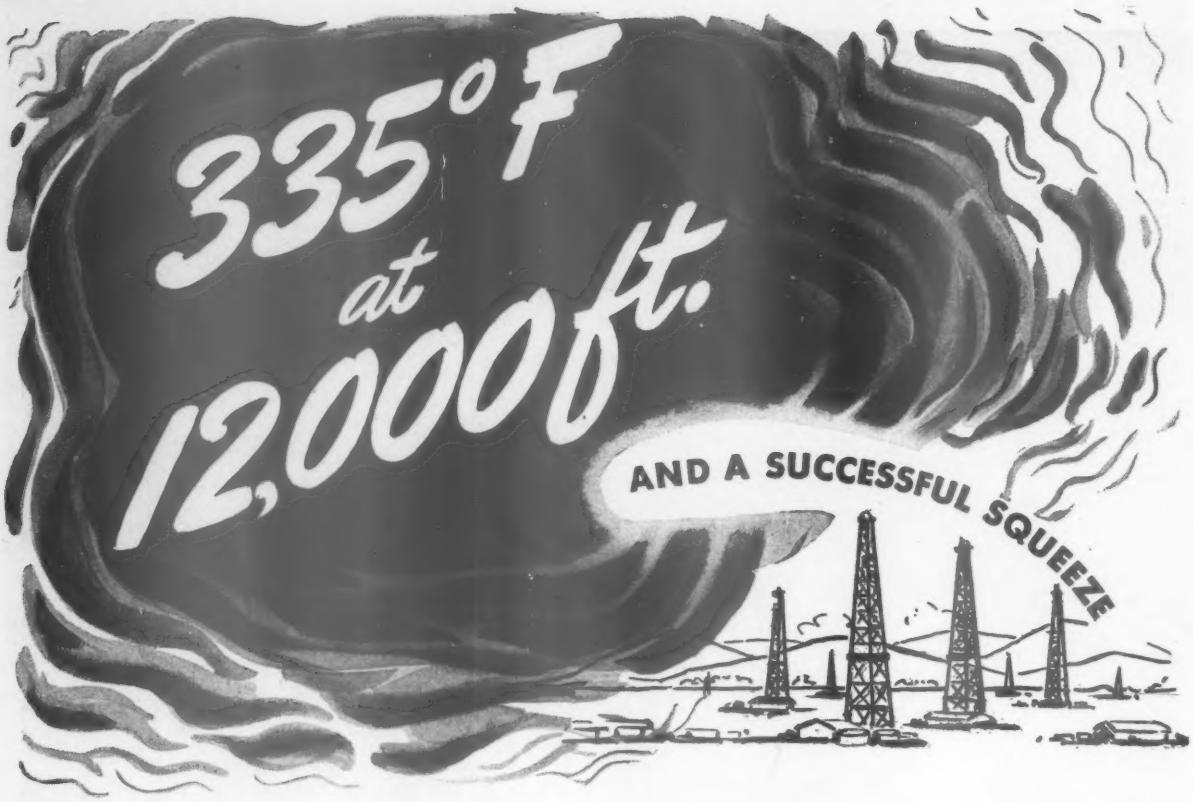
CONSTRUCTION in these rugged mountains is one of the current activities of the W. A. Bechtel Co.

W. A. BECHTEL CO.

Constructors

SAN FRANCISCO

Project illustrated: A joint venture, Bechtel-Price-Callahan



Improved *Unaflo*—the oil-well cement with retarded *set*—came out fluid and pumpable after tough test.

SOUTHERN LOUISIANA wells come deep and hot, and operators insist on a cement that can take the punishment. *Improved* Unaflo was developed for that kind of job and is doing it every day.

Improved Unaflo cement was chosen for a retainer squeeze on a well more than 12,000′ deep. Bottom-hole temperature was 335°F., and pressure at the truck reached 6,000 lb. per sq. in. After the squeeze, the excess slurry was still fluid and was reversed out of the pipe under normal pump pressure.

The answer is that *improved* Unaflo is not just a slow-setting cement, but a cement with *retarded* set. *Improved* Unaflo remains fluid and pumpable for extended periods under different hole temperatures and pressures, then hardens normally to form a dense and impermeable seal.

On any oil-well cementing job where a *retarded* set is desirable, *improved* Unaflo will provide an extra margin of safety. It protects your valuable investment. Try it on your next job.

For further evidence of Unaflo's performance not only on tough jobs like this one but also on ordinary jobs, see Composite Catalog, or ask for "Case Histories of Oil-Well Cementing." Write to Universal Atlas Cement Company (United States Steel Corporation Subsidiary), Amicable Building, Waco; Oklahoma City; Kansas City; Chicago; Birmingham.

OG-U-36

EQUIPMENT manufactured where it will be used

FOR MANY YEARS oil men have bought a long list of dependable Texasteel pumping equipment items because Texasteel products are GOOD products—manufactured with proper attention to the controlling factors of Material, Design and Workmanship.

But there are other advantages to buying from Texasteel Mfg. Co. The strategic location of our manufacturing plants—and associated steel mills in the heart of the mid-continent area—may mean important savings to you in time and shipping costs—PLUS a reduction of the burden on vital transportation facilities.

Because of war demands on our integrated facilities, we are confining our production of oil field equipment to API Sucker Rods, Pull Rods and Polished Rods and a few other well known Texasteel products.

When the war is won, you can look to Texasteel Mfg. Co. for new and radically improved products and a continuation of the finest service you ever knew.

Texasteel
ELECTRIC STEEL

TEXASTEEL MANUFACTURING CO.

FORT WORTH, TEXAS

ANOTHER GROUP OF TEXANS WORKING TO HELP WIN THE WAR

Flexibility of Operation

Essential in war production.. Vital to peacetime operation

FOR many years flexibility of operation has been a "built-in" feature of McKee-designed refinery units. Because of this "built-in" flexibility, modern McKee-engineered plants can be more readily adapted to the rapid developments in petro-chemistry.

Many new uses of petro-chemical products in a post-war economy will make flexibility of operation a vital necessity of successful peacetime refinery operation.

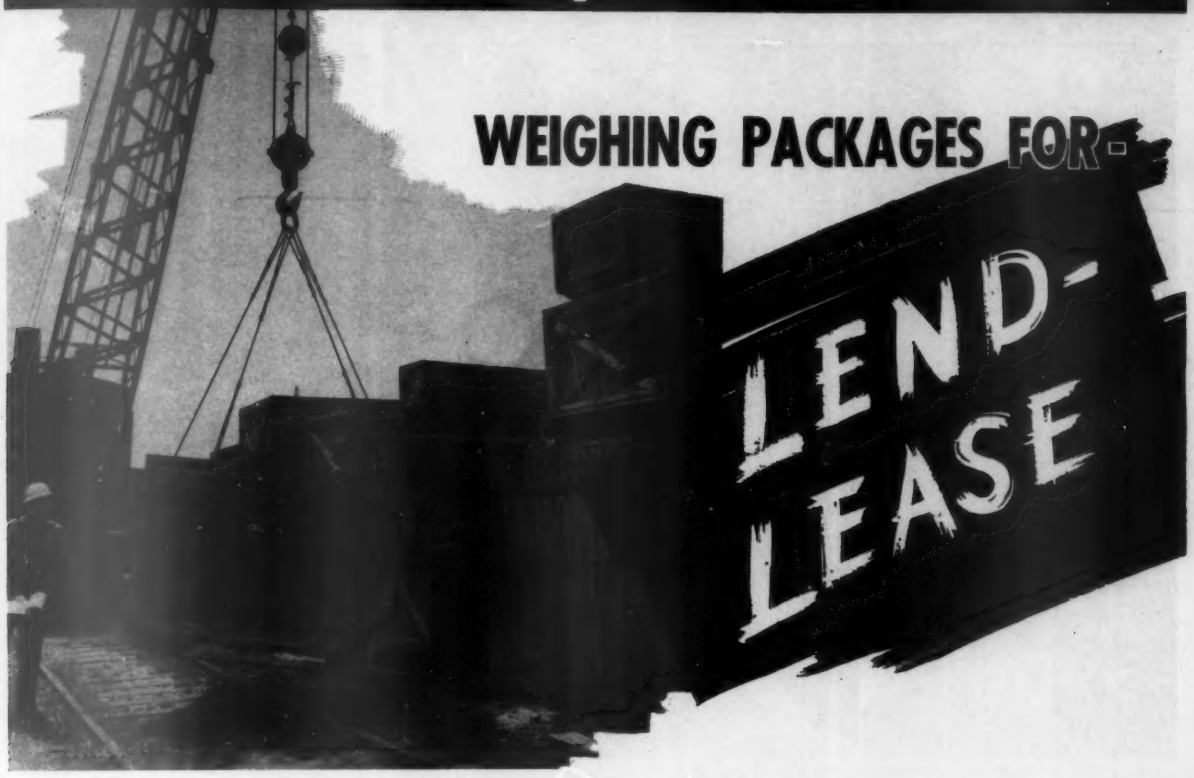
McKee process specialists, technical experts and refinery engineers can help plan your present construction or alteration program for maximum wartime production and quick conversion to peacetime operation.

Arthur G. McKee & Company

★ *Engineers and Contractors* ★

2300 CHESTER AVENUE · CLEVELAND, OHIO

Martin-Decker Plays a Wartime Role--



WHEN a large California industrial plant was dismantled and prepared for shipment to one of our allies, the contractors were suddenly faced with the problem of weighing packages ranging from a few hundred to hundreds of thousands of pounds. It was important that the weights be obtained quickly and accurately; and as there was no railroad scales near, the problem seemed a difficult one until Martin-Decker was consulted. A Toolpusher Type Weight Indicator was furnished with curves for the various cranes used in handling the packages, and correct weights were obtained as routine lifts were made.

Martin-Decker Toolpusher Type Weight Indicators, the same instrument which oilwell operators use on their rigs every day, are in use by the hundreds in other industries.

To us, serving the war effort means serving the oil industry, and we are mighty proud of that privilege. We are proud also that the instruments which we have developed in over 16 years' experience and service to the oil industry are now recognized as essential to many other phases of the war effort.

MARTIN-DECKER WEIGHT INDICATORS are extremely flexible and fill many diverse needs. They form the basic elements in the two complete drilling control instruments—the Sealtite and the Drillogger. Where permanent records are not required, the three Toolpusher models cover the entire range of drilling needs. The SPECIAL (capacity 630,000 lbs.) cares for the big job. The CLIPPER (capacity 480,000 lbs.) accommodates the medium job. And the SLIM HOLE (capacity 150,000 lbs.) handles the little job.

There is a Martin-Decker instrument for every weight control need!

THE CLIPPER

HOME OF THE WEIGHT INDICATOR

MARTIN DECKER CORP.

LONG BEACH, CALIFORNIA

SAN JOAQUIN VALLEY: A. F. McQUISTON, BAKERSFIELD, CALIFORNIA
MID-CONTINENT DISTRIBUTOR: REED ROLLER BIT COMPANY, HOUSTON, TEXAS

By improving equipment, applying new designs, J&L is increasing war-steel production

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FROM AN ORIGINAL DRAWING BY ORISON MACPHERSON

MEN OF SCIENCE AND SKILL EXPAND WAR-STEEL PRODUCTION

On the steel front the forward lines of production are backed up by the design-engineers and draftsmen, the maintenance men and construction crews. Scores of special engineers, in cooperation with experienced steel men, design new furnaces and develop mill improvements for increasing steel production. They coordinate their plans with the on-rushing future so that at the first opportunity, essential new work can be built with minimum interference to war-steel production. In the constant glare of adjacent furnaces, hundreds of riggers, welders, carpenters, bricklayers, pipe-fitters, electricians, men of a dozen crafts and trades, are working at a fighting pace building new steel-making facilities — rebuilding and improving others. Today, more steel than ever before — 85 million tons a year — is being produced to provide our fighting men with arms and equipment to crush enemy forces and to protect our own.

JONES & LAUGHLIN STEEL CORPORATION

PITTSBURGH, PENNSYLVANIA

CONTROLLED QUALITY STEEL FOR WAR

J&L STEEL

BAROID WEIGHTED MUDS

CONTROL FORMATION PRESSURES AND PREVENT CAVING

BAROID, the *pioneer* weighting material for drilling mud, has been successfully used in thousands of wells to control formation pressures and to prevent caving. Muds suitably weighted prevent blowouts. The speed of drilling operations is also increased. BAROID has a high specific gravity (almost twice that of most native clays) and will make pumpable muds weighing as much as 20 pounds per gallon (150 pounds per cubic foot). It may be added to the mud by means of a cone-and-jet type mixer, as shown above. BAROID is easy to transport and will not deteriorate in storage. BAROID is immediately available in 409 locations in the United States and Canada.

BAROID SAVES VALUABLE CASING

BAROID weighted muds have made possible the saving of thousands of tons of casing. Previously used protective strings can often be eliminated by sufficiently increasing the mud weight with BAROID to hold back caving or sloughing formations and high gas, oil and water pressures.

PATENT LICENSES on a royalty basis, unrestricted as to sources of supply of materials, will be granted to responsible oil companies and operators to practice the inventions of any and/or all of United States Patents Nos. 1,807,082; 1,991,637; 2,214,674; 2,294,877 and further improvements thereof. Applications for such licenses should be made to the Los Angeles office.

BAROID SALES DIVISION
NATIONAL LEAD COMPANY
BAROID SALES OFFICES: LOS ANGELES • TULSA • HOUSTON

BAROID PRODUCTS: BAROID and COLOX • AQUAGEL • FIBROTEX • BAROCO • STABILITE • AQUAGEL-CEMENT SMENTOX • ZEOGEL • IMPERMEX • MICATEX • TESTING EQUIPMENT • BAROID WELL LOGGING SERVICE

Spicer Universal Joints—

okay for peacetime Mack . . . . now deliver the mighty PT *smack!*

175 horsepower in the Mack . . . or 1350 horsepower in each of the three motors for the swift PT . . . it's all the same to the standard Spicer Needle-Bearing Universal Joints. So good, so strong, so ample in overload capacities are these Spicer units, that WITHOUT CHANGE they were immediately adapted to PT Boat production. And this Spicer versatility will assure quick, efficient conversion to peacetime needs when the war is won. Spicer Manufacturing Corporation, Toledo, Ohio.

40 YEARS OF SERVICE

BROWN-LIPE CLUTCHES AND TRANSMISSIONS • SALISBURY FRONT AND REAR AXLES

SPICER UNIVERSAL JOINTS • PARISH FRAMES, STAMPINGS

too little too late

WARNING!

PRESSURES EXCEED 3000 LBS. BELOW 7000 FEET

SWITCH TO CAMERON 6000 LB. TEST DRILLING CONTROL UNITS

When a well starts "unloading" from below 7000 feet, it's too late to replace drilling control units of too little capacity!

Since the normal potential bottom hole pressure of any well passes the 3000 lb. mark below 7000 feet, the operator who drills beyond that depth without 6000 lb. test drilling control units, regardless of mud weight, is inviting trouble.

To date, not a single well equipped with Cameron 6000 lb. test pressure-operated drilling control units has suffered a blowout due to failure of the control equipment, which clearly establishes it as the industry's most dependable safeguard against destructive well pressures.

To protect irreplaceable drilling machinery and to conserve valuable reservoir pressures, operators on wells projected below 7000 feet are urged to use Cameron 6000 lb. test pressure-operated drilling control units—Cameron Type "SDA" Blowout Preventers to seal around pipe in the hole; Cameron Type "DV" Gate Valves to seal the well bore while pipe is out of the hole; and Cameron Type "DV" Flowline Valves to guard against loss of control through the flowline.

CAMERON IRON WORKS, INC.

711 MILBY ST., HOUSTON, TEXAS

***Export*—74 Trinity Place, New York, N. Y.; *California*—Howard Supply Co., Los Angeles; *Rocky Mountain*—Mountain Sales and Service, Casper, Wyoming.**

POWER TO WIN
POWER TO WIN means striking power — and power available at instant notice, even under the guns of the enemy, to keep our hard-hitting equipment on the move and in action. Absolute dependability, the greatest asset of Continental Red Seal Engines, is providing POWER TO WIN for vital equipment on all fronts — in the air, on land and sea; also for our farms, oil fields, and for industry.
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Awarded to the Detroit and Muskegon Plants of Continental Motors Corporation for High Achievement.
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MUSKEGON, MICHIGAN
Your Dollars Are Power, Too! . . . Buy War Bonds

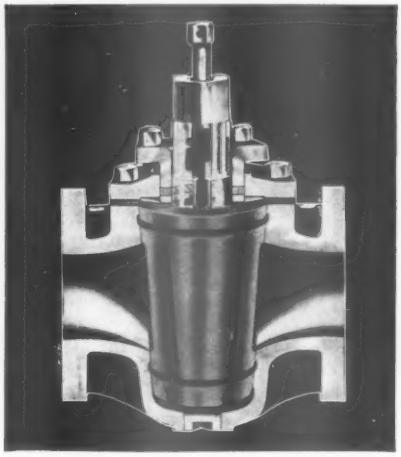
MAINTAIN FLOW-LINE TRAFFIC CONTROL THROUGH *NORDSTROM VALVES*

Switches on a railway have to be positive. Foolproof control of flow lines in any plant is likewise essential. If a valve closure has to be screwed down and cinched to effect a tight seal there's a strain somewhere which later may cause failure. But in a Nordstrom Lubricated Valve no strain, no cinching, no screwing down against a seat, occurs. You merely turn the plug 90° where it hits a stop. The plug rotates on a seat of lubricant. No skill is required of the operator. A full shut-off can be accomplished in a moment's time. No cinching threads are exposed to the elements. Here is the surest, safest, quickest way to control traffic through any flow-line. *Keep upkeep down with Nordstrom Valves.*

ABOVE *is presented an unretouched natural color photograph of a 16" Nordstrom Lubricated Plug Valve, spur gear operated, in service on a natural gas line. Other sizes range from ½" to 30"; wrench or gear-operated. Available in pressure ranges up to 15000-lb. test, in ratings to conform to A.S.A. and other recognized standards. Descriptive Bulletins upon request.*

The Nordstrom system of valving makes leak-proof performance a certainty!

The Nordstrom way of valving is actually an engineering service which gives to your flow lines the surest and simplest means of blocking off line flow. We have taken the basic plug valve principle and applied to it the most practical engineering refinements. We have developed special plastic lubricants to give these valves the most effective lubrication over the widest range of conditions, from sub-zero to temperatures reaching up to 1000° F.; also for all manner of line contents—gases, liquids and chemical solutions. Further, we have developed Merchrome Coating as an added armor against corrosion and erosion. By use of the lubricated plug principle, Nordstrom Valves are reinforced to withstand the stresses of high pressures. Lubrication, applied hydraulically by our patented "Sealdport" system, permits easy turning of the plug, provides a permanent seal and means of releasing the plug if it should ever become hard to turn.



Nordstrom LUBRICATED VALVES

Sealdport Lubrication

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WORLD'S LARGEST MANUFACTURERS OF LUBRICATED PLUG VALVES; GASOLINE, OIL & GREASE METERS

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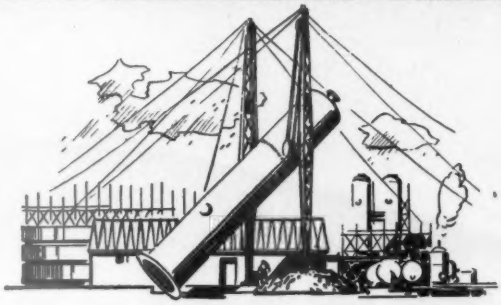
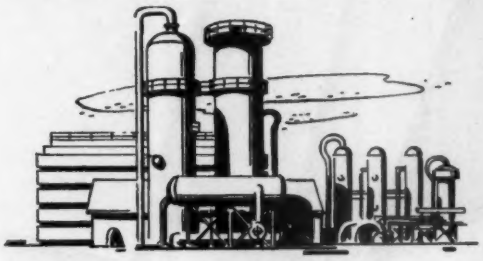
Capitalize on Fluor's Record

ALWAYS **ON TIME** *– FROM PLAN TO PLANT*

FROM *LAYOUT DESIGNING AND ENGINEERING*





THROUGH *CONSTRUCTION TO COMPLETION*

THIS FLUOR SERVICE IS AVAILABLE NATIONWIDE

An all-embracing combination of *special skills, adequate manpower, ample equipment, process research and over a half century of construction experience* forms the substantial reservoir from which Fluor can serve you in building from plan to plant, *on time,* the country over.

Fluor has built, is building and *will build* synthetic rubber, toluene, catalytic cracking, isomerization, alkylation, gas transmission, recycling, and natural gasoline plants and petroleum refineries.

Today, in addition to some of the finest project engineers in the country, Fluor has available a complete diversified engineering staff of over 400 men. Fluor maintains and owns its own construction equipment, capable of handling the largest construction job.

Capitalize on these Fluor facilities and Fluor's record for completion on time.

From plan to plant, be sure with Fluor

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DESIGNERS [illegible] STRUCTORS

FLUOR

How to select the correct N.E. STEEL!

N.E. TYPES COMPARED WITH A.I.S.I. TYPES
CROSS SECTION HARDNESS OF ROUNDS
TENSILE STRENGTH TESTS
IZOD IMPACT TESTS
N.E. TYPES COMPARED WITH A.I.S.I. TYPES
N.E. END QUENCHED HARDENABILITY
INSTITUTE

● Republic's N. E. Steel Handbook will tell you how! It will bring you valuable facts and information prepared by the same men who helped develop the National Emergency Steels — Republic metallurgists.

This timely book offers an unusually complete description of the N.E. Steels, their chemical analyses, physical properties, their relationship to standard steels and why they substitute satisfactorily for high alloy steels.

It presents the very information you need on how to select the correct N.E. grade for each application, how to fabricate it and the precautions to exercise. It explains the end quench hardenability test and why it is used in predicting certain physical properties. It contains many useful tables, including combined standard lists of A.I.S.I. and S.A.E. steels.

Thousands of these books already have been distributed and are proving of inestimable value in helping steel users speed up and increase war production. If you are an engineer, metallurgist or production executive using N.E. steels, or if you contemplate changing to them, you should have a copy. Fill in and send the coupon below, and your book will be mailed promptly.

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—REPUBLIC—
Alloy **STEELS**

Republic Steel Corporation, Dept. OG
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Please send me a copy of your N.E. Steels Handbook

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Company _____

Street _____

City _____ State _____

A GUIDE TO BETTER MAINTENANCE FOR YOUR AUTOMATIC CONTROL VALVES

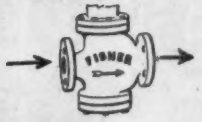
Follow these instructions carefully in the installation and operation of your Automatic Control Valves, and you'll be assured of better performance . . . longer life . . . lower upkeep cost and peak production schedules. A suggestion — be sure your maintenance personnel sees this "adv"! If you'd like additional copies we'll gladly send them on request.

CLEAN PIPE LINES BEFORE INSTALLING

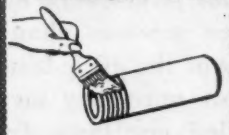
Before installing valves be sure to thoroughly clean and blow out pipe lines to remove scale, dirt and other foreign material. Apply same precaution to the valve body. Loose dirt and abrasives may seriously damage seating surfaces and working parts.

CHECK FLOW THROUGH THE BODY

Make sure the valve is installed so the flow through the body is in the same direction as that indicated by the arrow cast on the side of every Fisher valve body.



MAKE CONNECTIONS CORRECTLY

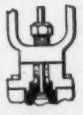


If the body has screwed connections, treat the male pipe threads with a good compound (do not apply compound to body threads) and draw them up tightly but not too severely. If the body is flanged, draw the bolts up uniformly and evenly.

DON'T OVER-LOAD DIAPHRAGMS

Avoid excessive pressures on diaphragms — they are furnished to operate within specified pressure limits. New diaphragms are on the critical material list, replacements take time, interrupt production.

GIVE PROPER CARE TO STUFFING BOXES



Stuffing box packing must be kept soft and pliable either by replacement or lubrication to insure best valve performance. Neglected packing will harden and cause undue friction and sluggish operation. Use only genuine Fisher ring packing for replacement. To stop stuffing box leakage, turn the nut down one-half turn and then back it off one quarter turn. Continue this only until leakage is stopped. Excessive tightening will result in imperfect control.

FISHER GOVERNOR COMPANY
Fisher Bldg., MARSHALLTOWN, IOWA

ALL FISHER AUTOMATIC CONTROLLERS

are shipped with specific installation and operation instruction sheets attached. Additional copies of these instructions will be furnished on request.

For your further convenience and guidance, we offer specially prepared maintenance manuals applying to your specific Fisher control equipment. Send us the Serial Numbers or Type Numbers of those controls and we will prepare and mail your manual promptly.

Tooljoints are Precious

PROTECT THEM

with

THREDKOTE

HUMBLE THREDKOTE IS REG. U.S. PAT. OFF.
By H. O. & R. CO.

Tool joints were never more important, never more precious, than they are today. As a vital part of the oil industry's production system, tool joints must stay on the job. As a product of skilled craftsmen from critical materials, tool joints must not be wasted. Thredkote protects tool joints by preventing thread galling, by producing tight joints that resist channeling, and by combating the formation of rust. In the bucking-on machine, in transit to the job and on the rig, Thredkote is a tool joint's best friend.

★

There are eight Thredkote compounds, each designed for service on specific types of threaded connections. For the complete Thredkote story write Humble Oil & Refining Co., P. O. Box 2180, Houston, Texas.

THREDKOTE IS MANUFACTURED AND DISTRIBUTED BY

HUMBLE OIL & REFINING COMPANY

Watch those Grooves

...if you want your wire rope to last

GROOVES that are too wide do not give proper side support, causing a flattened rope. If the grooves are too narrow they will pinch the rope, with resultant rapid wear. In each case the distorted rope is not free to adjust itself so that each strand carries its own share of the load. Not even a quality rope like U·S·S American Tiger Brand will last as long as it should under such conditions.

Make it a point to adhere to recommended tolerances for groove diameters. Check your sheave and drum grooves frequently to see that they are in good condition. Be sure that grooves are smooth and that sheaves with broken flanges are replaced before they can cause damage. Only by giving your rope such care and attention can you get the *maximum* service that is a war-time must today.

Here's a book you need right now

Every user of wire rope can get a lot of good ideas from this free book. It's packed with easy-to-follow instructions, 48 pages of practical hints that will help avoid the common errors of handling and care which shorten rope life. Order as many copies as you need and get them into the hands of the right men.

AMERICAN STEEL & WIRE COMPANY
Cleveland, Chicago and New York
COLUMBIA STEEL COMPANY
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Excellay Preformed

UNITED STATES STEEL

"Ask the man who runs one"

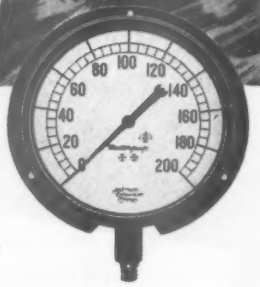
★ The time-honored Packard slogan can be applied with real force and significance to the machinery of war. Whether it's a jeep, a tank, a plane, or a battleship, just "ask the man who runs one". From all reports his verdict will be: "It's O.K., Uncle Sam; It's got what it takes!"

In wartime such a testimonial is not for one manufacturer, but for all who had a hand in the achievement. The products of peace wear the bright name plate of a particular manufacturer; in war, the individual must be forgotten. The tank or plane is not a Buick or Chrysler or Ford. It is just a "U.S.A." —a product of a large portion of U.S. industry. The individual's pride of achievement must give place to something greater — the collective pride in masterpieces achieved by all industry working together in an All-American team.

Along with thousands of other manufacturers, James P. Marsh Corporation is on that team. True, the gauges, dial thermometers and other instruments we are furnishing are not shot at enemy positions or dropped on Tojo's palace. But they are an essential part of almost anything you can mention for directly or indirectly attaining such objectives.

They have simply a little job in a big war; but you who know Marsh Instruments and heating specialties will agree that there is no equipment more capable of handling the jobs for which it has been chosen.

JAS. P. MARSH CORP., 2065 Southport Avenue, Chicago, Ill.



The Marsh MASTERGAUGE

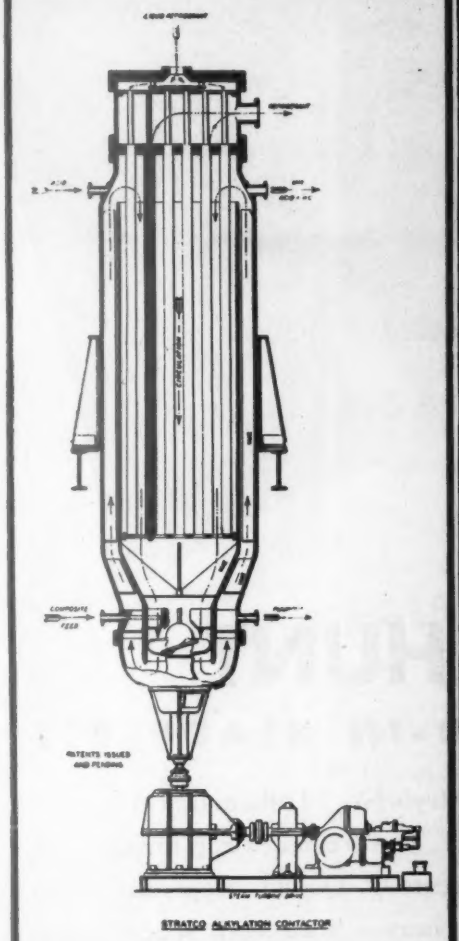
Ask in the oil fields about the "Mastergauge" and you'll learn about a gauge that has brought new meaning to accuracy and stamina. The highest achievement of more than 75 years of gauge-making, it is serving under the most arduous conditions encountered in the oil industry.

An important feature of the "Mastergauge" is the "Recalibrator"—the best and simplest means ever developed for correcting a gauge that has been knocked out of adjustment. Simply turn the "Recalibrator" screw until the pointer is at zero when not under pressure. The gauge will then be accurate at all points on the dial.

MARSH GAUGES

DIAL THERMOMETERS ★ RECORDERS ★ HEATING SPECIALTIES

STRATCO ALKYLATE



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Higher Yield
Higher Octane

Result:

MORE FIGHTING FUEL

STRATFORD ENGINEERING CORPORATION

PETROLEUM REFINING ENGINEERS

DIERKS BLDG. KANSAS CITY, MO.

"Well Digger"

THAT MADE GOOD!

The HUNT

WELDED-IN BLADE BIT

It's the oil country's No. 1 Hole-maker. Has cast alloy steel body, heat-treated; drop forged steel blades, heat-treated. Quickly replaced when worn. Fluid courses lined with special alloy bushing. Made in 2-way and 3-way types.

Hunt makes a bit to meet every drilling requirement. Full details in your Composite Catalog, or Hunt Catalog.

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HUNT TOOL COMPANY

HOUSTON, TEXAS, U. S. A.

A NEW BULLETIN ON A NEW METER

REPUBLIC PNEUMATIC DIFFERENTIAL PRESSURE TRANSMITTER

FOR MEASUREMENT OF FLOW AND LEVEL

The Republic Differential Pressure Transmitter is a device for converting a differential pressure, such as is produced by the flow of a fluid through an orifice or by liquid level in a vessel, into an air pressure which varies proportionately with the differential pressure. This air pressure is used as a direct measure of the differential pressure and can be conducted to a remote location by means of tubing. A gage or receiver connected anywhere in this transmission line will show the variation in the differential and may be graduated in terms of the flow or level which it represents. The pressure can also be utilized as the impulse for actuating a controller.

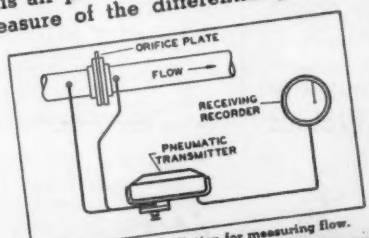

Fig. 2—Typical installation for measuring flow.

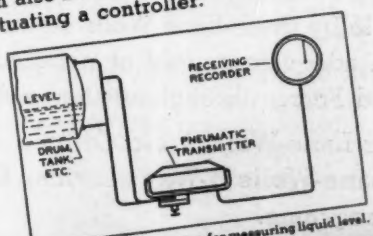

Fig. 3—Typical installation for measuring liquid level.

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BULLETIN No. 43-4

REPUBLIC FLOW METERS CO.

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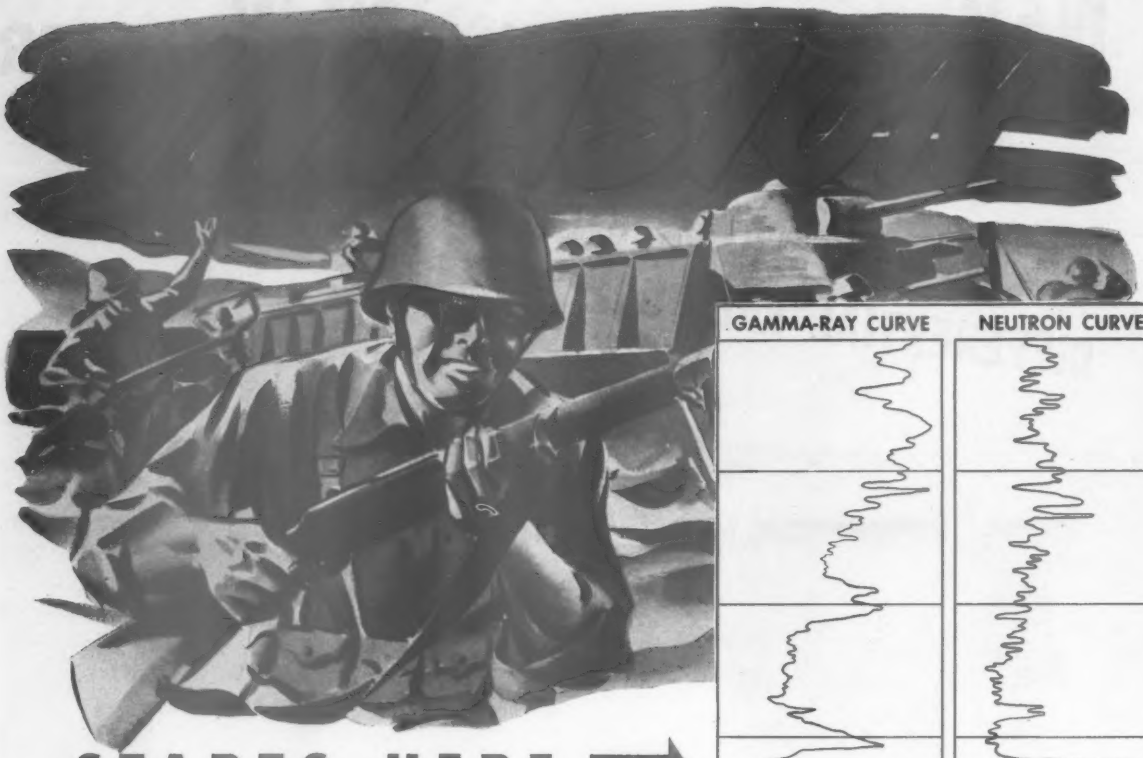

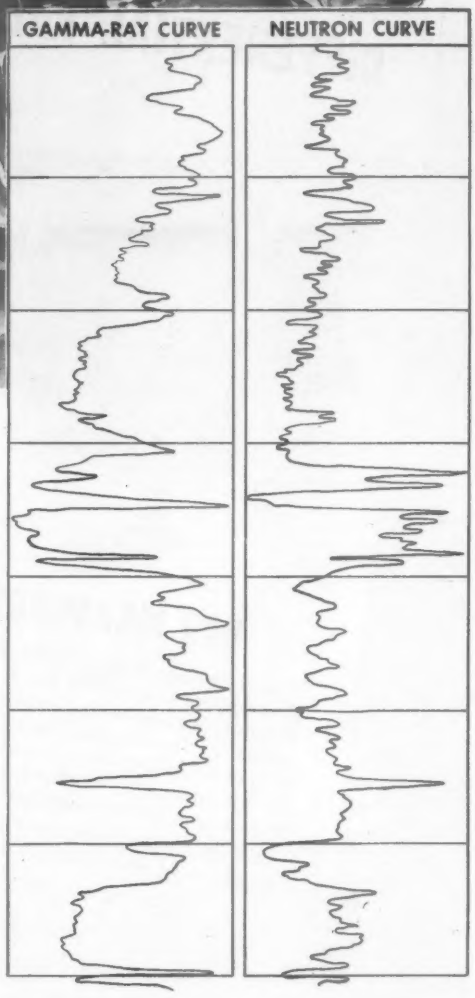

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Millions of barrels of oil—additional production that was cased off during original completion programs—are flowing into tankers and airplanes to provide fuel for INVASION. The steel, ordinarily required, is being used for tanks, guns and ships.

Lane-Wells provides American oil well operators with the services and tools that enable them to produce *more* oil *more* efficiently, with *less* steel. The methods made possible by these Lane-Wells services will help to assure an adequate supply of petroleum products for the Allied Forces throughout the world.

Call your Lane-Wells Field Office for complete details of Lane-Wells 3-Way services for efficient remedial programs.

FIGHTING *Tomorrow's Tools-Today!*

LANE WELLS COMPANY

LOS ANGELES · HOUSTON · OKLAHOMA CITY

General Offices and Export Office: 5610 So. Soto St., Los Angeles

24-HOUR SERVICE · 30 BRANCHES

Fig. 375—Bronze Gate Valve for 200 pounds W. P. Has screwed ends, union bonnet, inside screw rising stem and a special hard bronze disc.

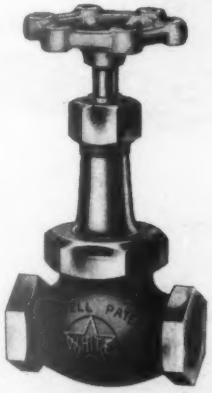


Fig. 1708—Bronze Globe Valve for 200 pounds W. P. Has screwed ends, union bonnet, renewable seat and regrindable, renewable hard bronze semi-cone plug type disc—especially adapted for throttling service—for the control of low-pressure steam, oil, water, gas, etc.

Beginning of a long life in the POWELL Line

Before a Powell Valve earns the right to bear this time-honored name, it is called upon to prove its acceptability into an illustrious family. In blunt words, it must fill a need—actual or anticipated—before it is permitted the responsibilities of the family name.

From the moment of its conception by Powell engineers and consultants, that valve is engineered to its purpose. It must meet every requirement of "Standard of Control", which is the family motto.

This goes for *all* Powell Valves . . . of every type . . . of every proved-in-service material . . . for every need. Powell takes this special care because its near-century-old name rests upon the *pre-determined performance of every Powell Valve.*

The Wm. Powell Co.

Dependable Valves Since 1846

Cincinnati, Ohio

POWELL VALVES

PAST, PRESENT AND FUTURE...

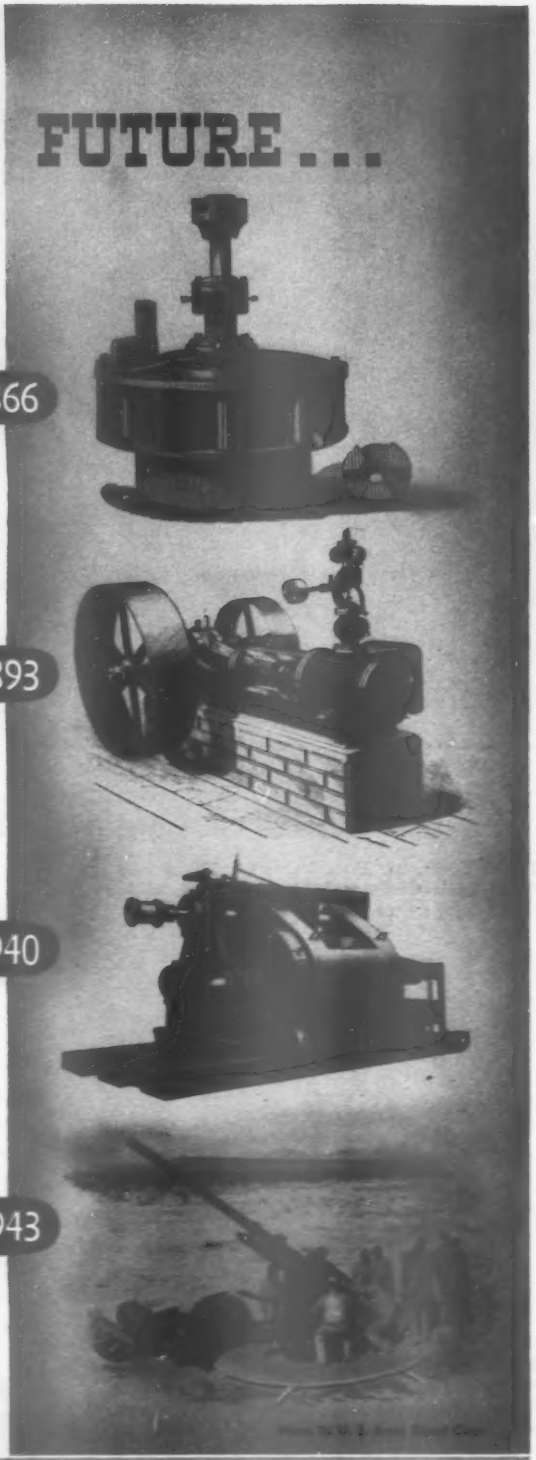
IN 1866, machine tools as we now know them existed only in the minds of highly imaginative men. In those days it was necessary to chip and file almost every machine operation by hand.

Yet 77 years ago, we made Water Wheels, Cane-Mills, Sawmills and Engines that were noted for quality, good workmanship, and resulting long life.

We could not have weathered the depression storms of over three quarters of a century if we had deviated from the principles established by our Founder. He would not make something to sell for less if it meant any sacrifice of quality.

We are thankful for the exacting standards and requirements of our Army Ordnance and Maritime Commission. To win this war, our equipment must excel that made by our enemies, and in doing our part of it, we have learned much that will be reflected in the machines we build in the future for Peacetime use.

NOTE: The Water Wheel and Engine pictures reproduced here are from wood cut illustrations in Wheland Catalogs issued in 1877 and 1893 respectively.

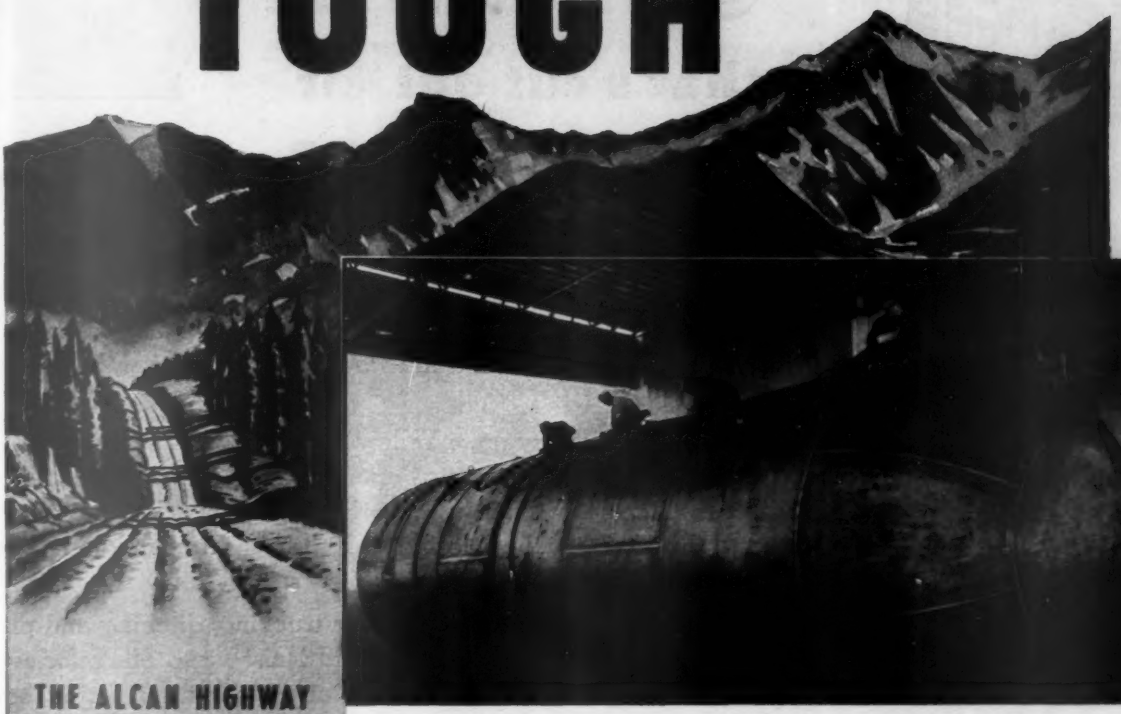


THE WHELAND COMPANY

ROTARY DRILLING EQUIPMENT

Chattanooga, Tenn.

TOUGH



THE ALCAN HIGHWAY

— an engineering epic, breath-taking in size and ruggedness, imaginative in concept, but a military necessity — therefore, the impossible was done and in record-breaking time.

In half a year, stretching 1800 gruelling miles, through the vast wilderness of British Columbia, over frothy streams and the rugged mountains of the Yukon Territory, through the ice-locked back door of Alaska, was blazed a highway linking civilization with our northern outposts.

Courageous men of purpose, with tough equipment, working most often in arctic storms and temperatures 35 degrees and more below zero, have again written history for a great continent!

FOR TOUGH ASSIGNMENTS

Like the mighty builders of the Alcan Highway, Standard Steel has won a reputation for tough jobs done with the precision, speed and quality demanded by war or peace-time conditions.

For more than 20 years, Standard Steel has served Industry in the design, fabrication and erection of equipment built from steel plate.

Illustrated above is one of a battery of pressure vessels being completed for an oil company. Sturdy, rugged construction down to the last detail affords long-time, trouble-free performance.

Though devoted to the war effort "around the clock"—expanded plant capacity affords the opportunity to bid on additional difficult jobs. Perhaps a Standard Steel engineer can help with YOUR production problem.

Write today for detailed information on Standard's service to the Oil Industry.

THIS EQUIPMENT, TOO, FOR THE OIL INDUSTRY

TOWERS	AGITATORS
TANKS	ABSORBERS
RECEIVERS	COOLERS
REBOILERS	WATER SOFTENERS
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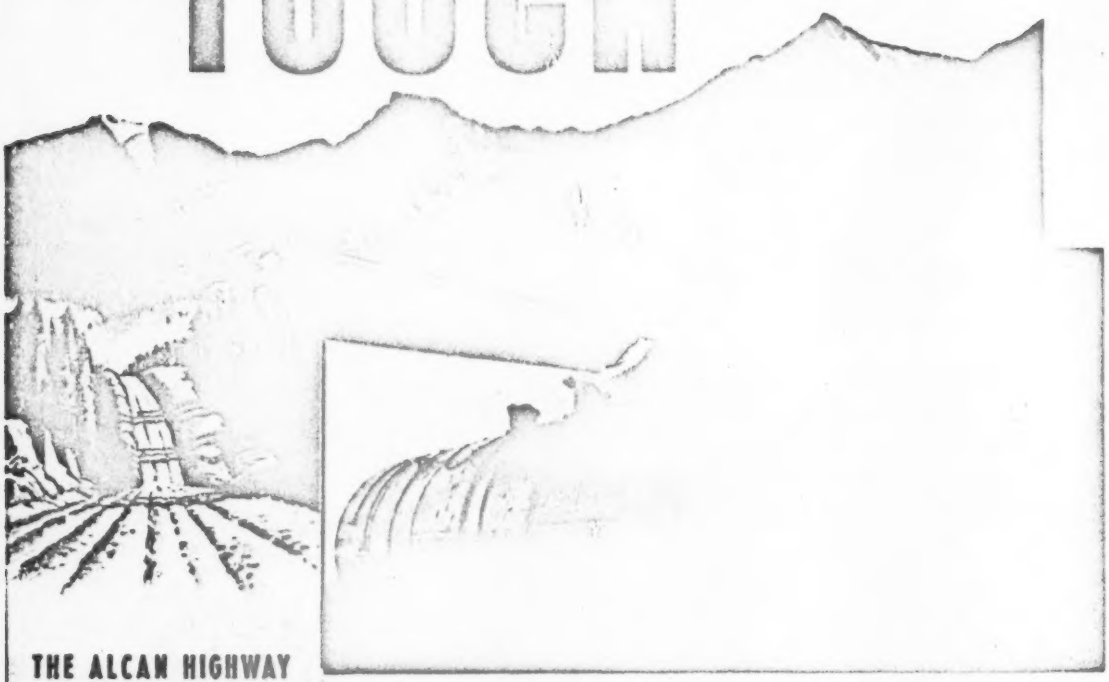

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STANDARD

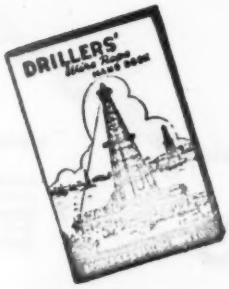
Use the wire line that's cut out for today's job

There's no place for slack in the petroleum industry's prog —or in a vital wire line. To keep production moving under press to *accelera'*, you need the workability and durability of Prefor Yellow Strand.

On your rotary rig, a Yellow Strand Preformed Drilling Line he the crew shorten dozens of operations. It reeves easily through blocks . . . spools snugly . . . works in quickly to handle heavy stri and overloads, without losing its high resistance to kinking, whipp and drum crushing.

On other field jobs, too—as in trucking, ditching and pipe-lay —and on refinery lifts, Winch and Hoist Lines of Preformed Yel Strand aid equipment to deliver at capacity and bring complet *earlier.* Limbered by preforming, Yellow Strand's tough drawn order wires run freely around small sheaves . . . combat fatigue put off replacement. In addition to saving man-power and machi hours, this longer rope life conserves *steel* for America's tanks, sh and planes.

The B & B Distributor knows which Preformed Yellow Stra construction will give you the safe performance you must have w the economy you want. See him for your next wire line.



FREE—this 79-page Drillers' Hand Book of useful wire rope facts and tables. Send for it today.

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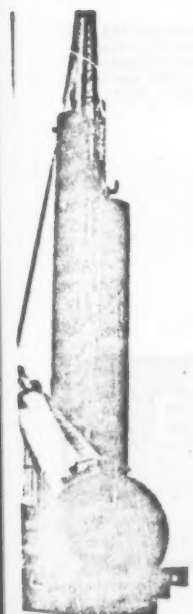
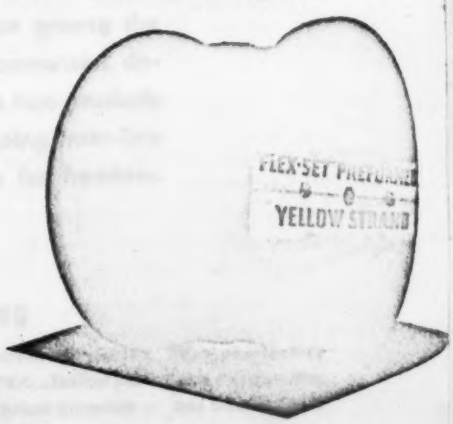
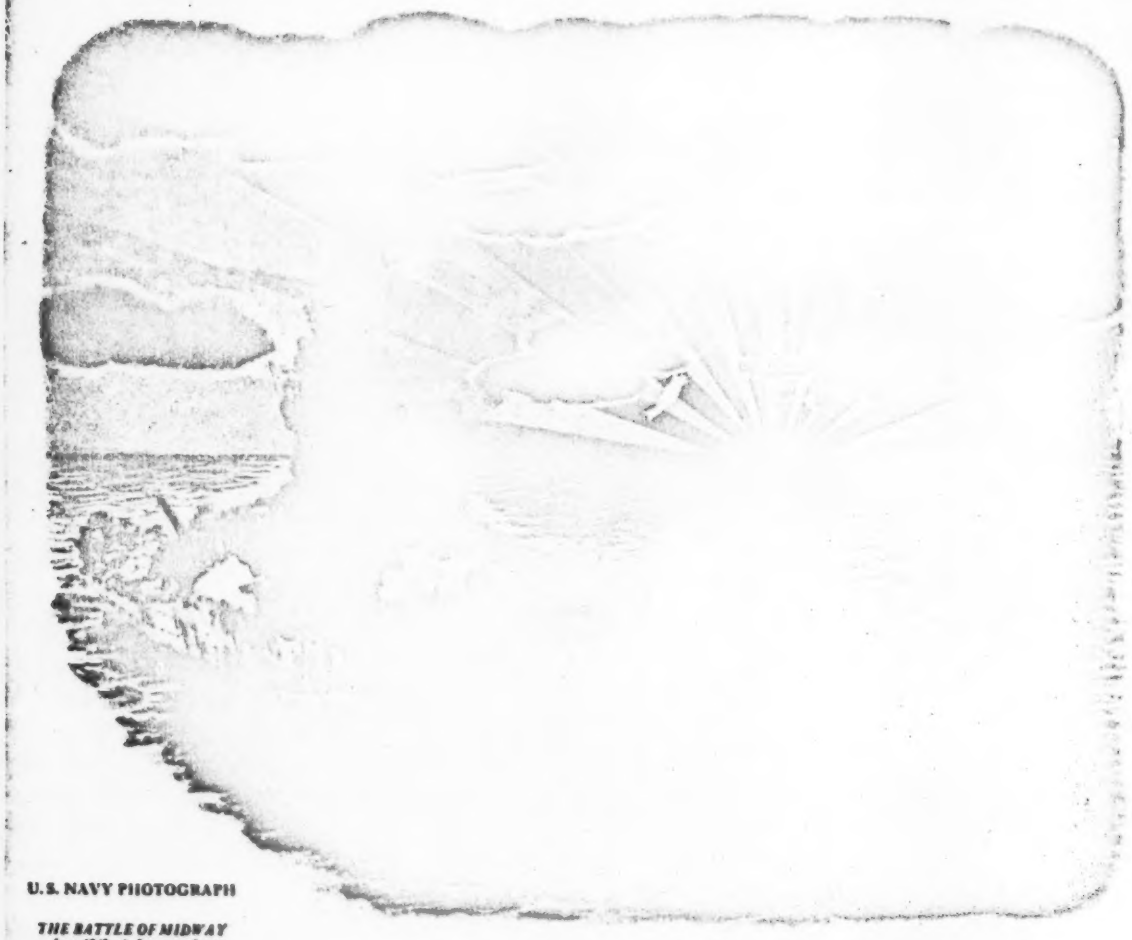






U.S. NAVY PHOTOGRAPH

THE BATTLE OF MIDWAY — June 1942. A Japanese heavy cruiser of the Mogami class after having been bombed by U. S. carrier-based naval aircraft.

On The Way Down

This Japanese heavy cruiser has felt the destructive might of American bombers, fueled with high octane aviation gasoline and loaded with high explosives derived from toluene.

KELLOGG has been among the pioneers in the commercial development of these two products which today are doing front-line duty in the battle for freedom.

KELLOGG

THE M. W. KELLOGG COMPANY

DESIGN, CONSTRUCTION and LICENSING

CATALYTIC PROCESSES for Cracking, Hydroforming, Reforming, Dehydrogenation, Alkylation, Desulphurization
CASOLINE PRODUCTS COMPANY, INC.....Pyrolytic Cracking • **THE POLYMERIZATION PROCESS CORPORATION**...Thermal and Catalytic Polymerization
JUIK Processes . . . for Lubricating Oil Refining with Propane and Phenol • Deasphalting • Dewaxing • Solvent Extraction and Acid Treating Plants

HE GAVE HIS LIFE

We are asked only to LEND our money

JIMMIE was a lovable, laughing youngster with all the world to live for. His mom was a peach, his dad a pal, and his girl so sweet he could hardly believe that she preferred his company to that of wealthier, smoother and more attractive lads.

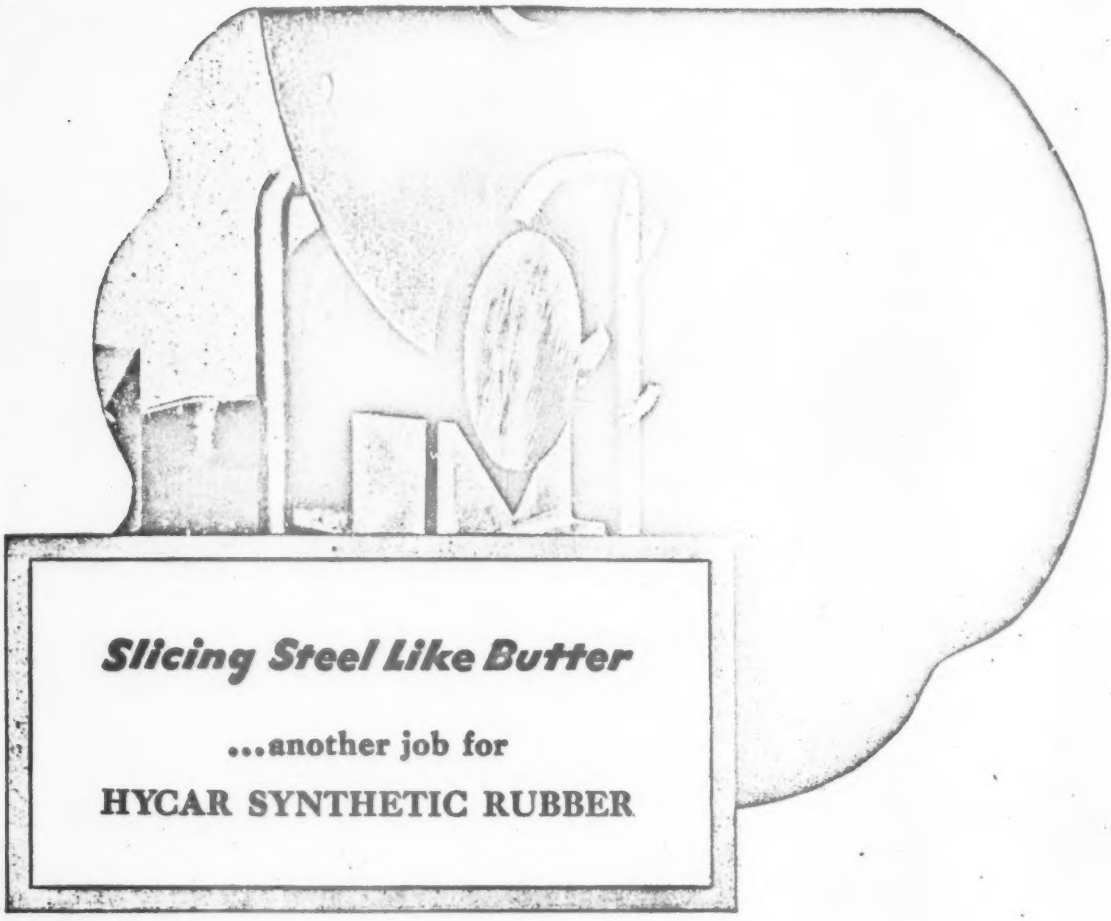
Saturday, December 6, 1941, Jimmie had the time of his life at a school dance. Sunday, December 7, he was glued to his radio. Monday, December 8, he was a member of the United States Army.

Jimmie stood up bravely under the hardships of training — but he couldn't stand up under the sharp, hot impact of a sniper's bullet.

Let's keep the picture of Jimmie in mind when we decide how much of our money we can invest in war bonds. His stake in America was no bigger than ours, his responsibility no greater. He gave his life. Can we do less than go the absolute limit in providing the things that Jimmie's buddies need to finish quickly the job they have started?

Sacrifice? Can any investment be called a sacrifice that is backed by the resources of the world's wealthiest nation? Is it a sacrifice to lend money with the assurance that it will be repaid with interest? Sacrifice? Let's ask Jimmie's parents the meaning of the word!

CONTRIBUTED TO THE WAR EFFORT BY GASO PUMP & BURNER MANUFACTURING COMPANY



Slicing Steel Like Butter

...another job for HYCAR SYNTHETIC RUBBER

HIGH-SPEED abrasive cut-off wheels that walk through heavy steel bars in a few seconds . . . this is not a place where you would expect to find synthetic rubber, but it's just one of thousands of ways Hycar has been used to improve essential products and processes throughout industry.

As the tough, durable bond that holds the particles of abrasive together in a cutting wheel, Hycar withstands the deteriorating effects of heat and oil-emulsion coolants, thus lessening wear and prolonging life of the wheel.

Resistance to oil—heat—abrasion . . . the qualities responsible for the superior performance of Hycar in this exacting service, are the identical qualities needed in many oil industry applications. Hose that withstands abrasion as well as oil; gaskets and seals that resist heat and compression-set; packers that retain their dimensional accuracy . . . these are just a few of the many ways Hycar is solving some of the oil industry's most persistent problems. For Hycar's wide usefulness lies in its ability to be tailor-made to fit the needs of each individual job. *Hycar Chemical Company, Akron, Ohio.*

Hycar is made in several types, supplied to fabricators in the form of crude synthetic rubber. We will be glad to work with you and your rubber products supplier in applying Hycar to your problems.

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LARGEST INDEPENDENT PRODUCER OF BUTADIENE SYNTHETIC RUBBER IN AMERICA

Get the Most Out of the Wheels

On Your Portable Grinders

OF course the first thing is to make sure you have the right grain and grade of Norton Wheels for the types of grinding you are doing. But even when this has been done, improper handling can waste many grinding wheels.

Set the grinder down carefully each time—where it can't fall against anything. A cracked wheel may fly apart.

When you change wheels for a different size or shape don't loosen the one on the machine by banging it. Use a wrench or vise.

Keep the wheel free cutting and in balance by truing when necessary. If the speed is too slow the wheels are apt to get out of round and out of balance.

Use just enough pressure to keep the wheel cutting at its best rate and still not slow down or stall the grinder.

Don't hesitate to call in a Norton abrasive engineer. He'll be glad to study your grinding jobs and make sure you are using the most suitable wheels.

NORTON COMPANY, WORCESTER, MASS.

Distributors in All Principal Cities

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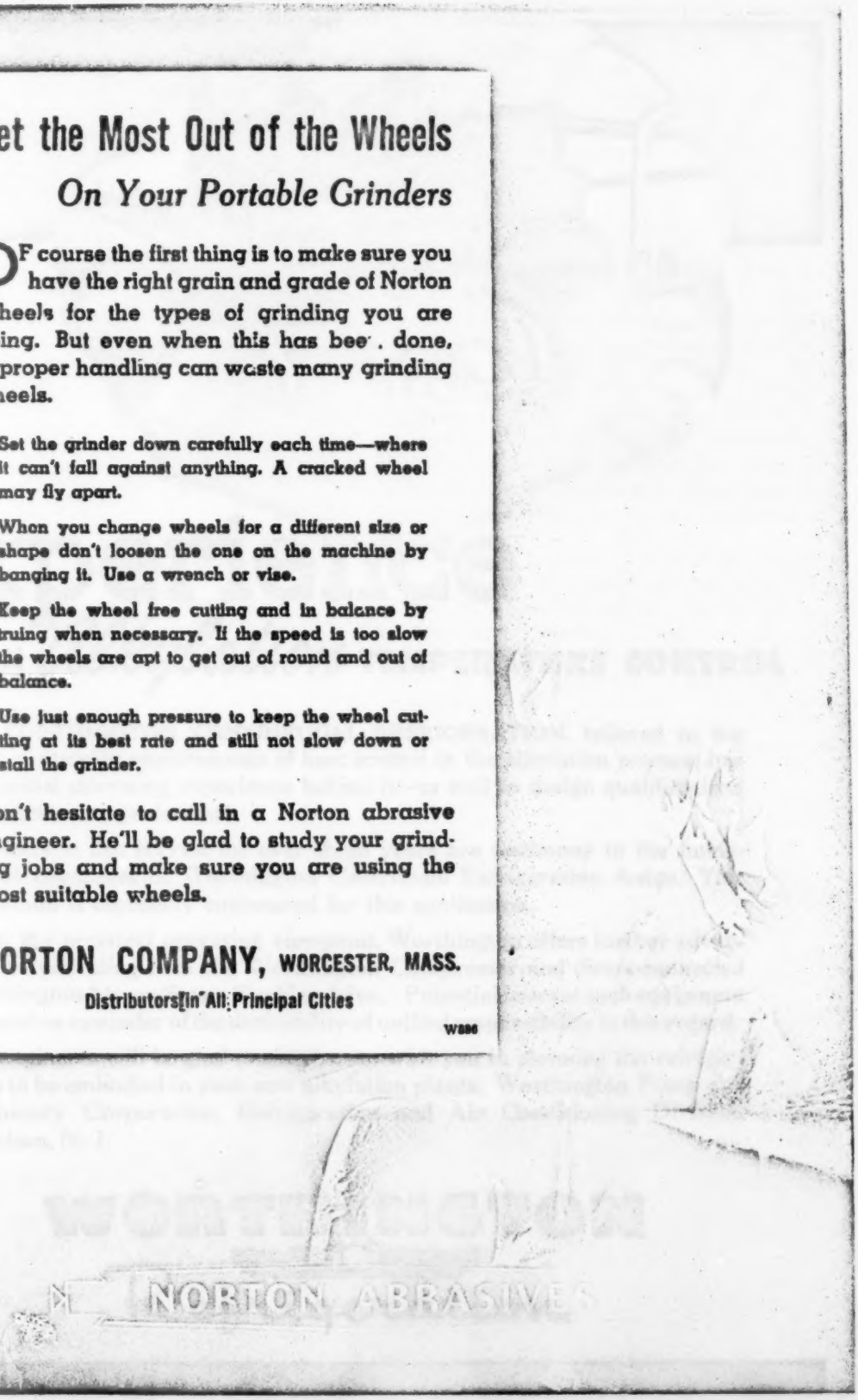
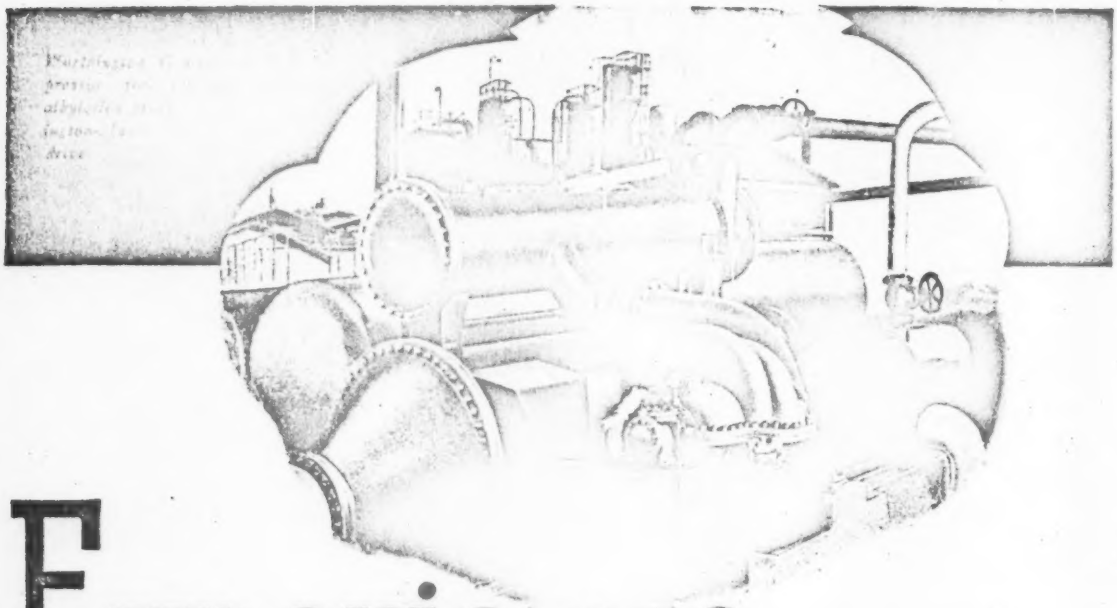




Experience

IN *Alkylation* TEMPERATURE CONTROL

WORTHINGTON CENTRIFUGAL REFRIGERATION, tailored to the particular requirements of heat control in the alkylation process, has substantial operating experience behind it—as well as design qualifications for engineering preference.

Machines in this service for over three years are testimony to the fundamental soundness of Worthington Centrifugal Refrigeration design. This equipment is especially engineered for this application.

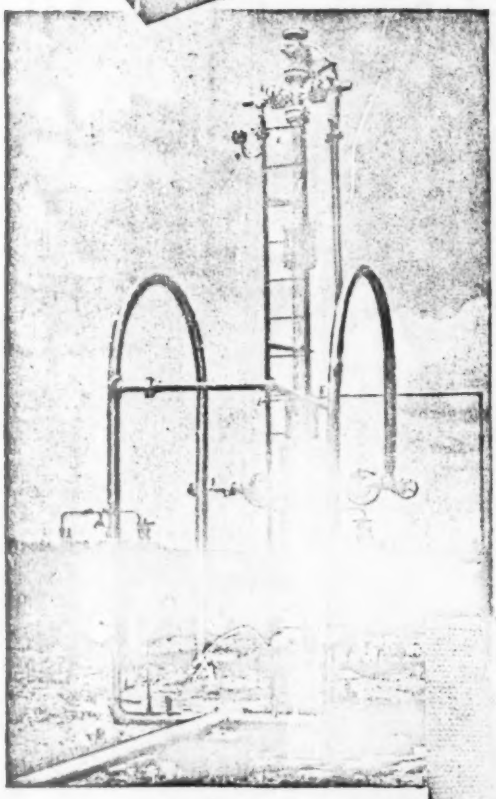
From the practical operating viewpoint, Worthington offers further advantage, in providing both the Worthington Compressor and direct-connected Worthington-Moore Steam Turbine drive. Potential users of such equipment will need no reminder of the desirability of unified responsibility in this regard.

Our engineers will be glad to collaborate with you in planning the refrigeration to be embodied in your new alkylation plants. Worthington Pump and Machinery Corporation, Refrigeration and Air Conditioning Division, Harrison, N. J.

WORTHINGTON

Refrigeration

All 9 Lives!



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Metric-American orifice meters installed near well head.

☆ ☆

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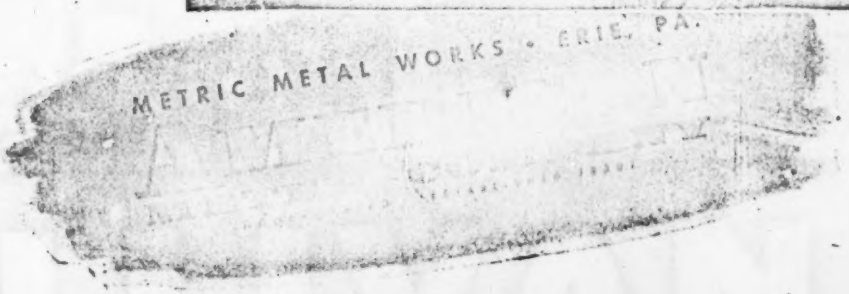

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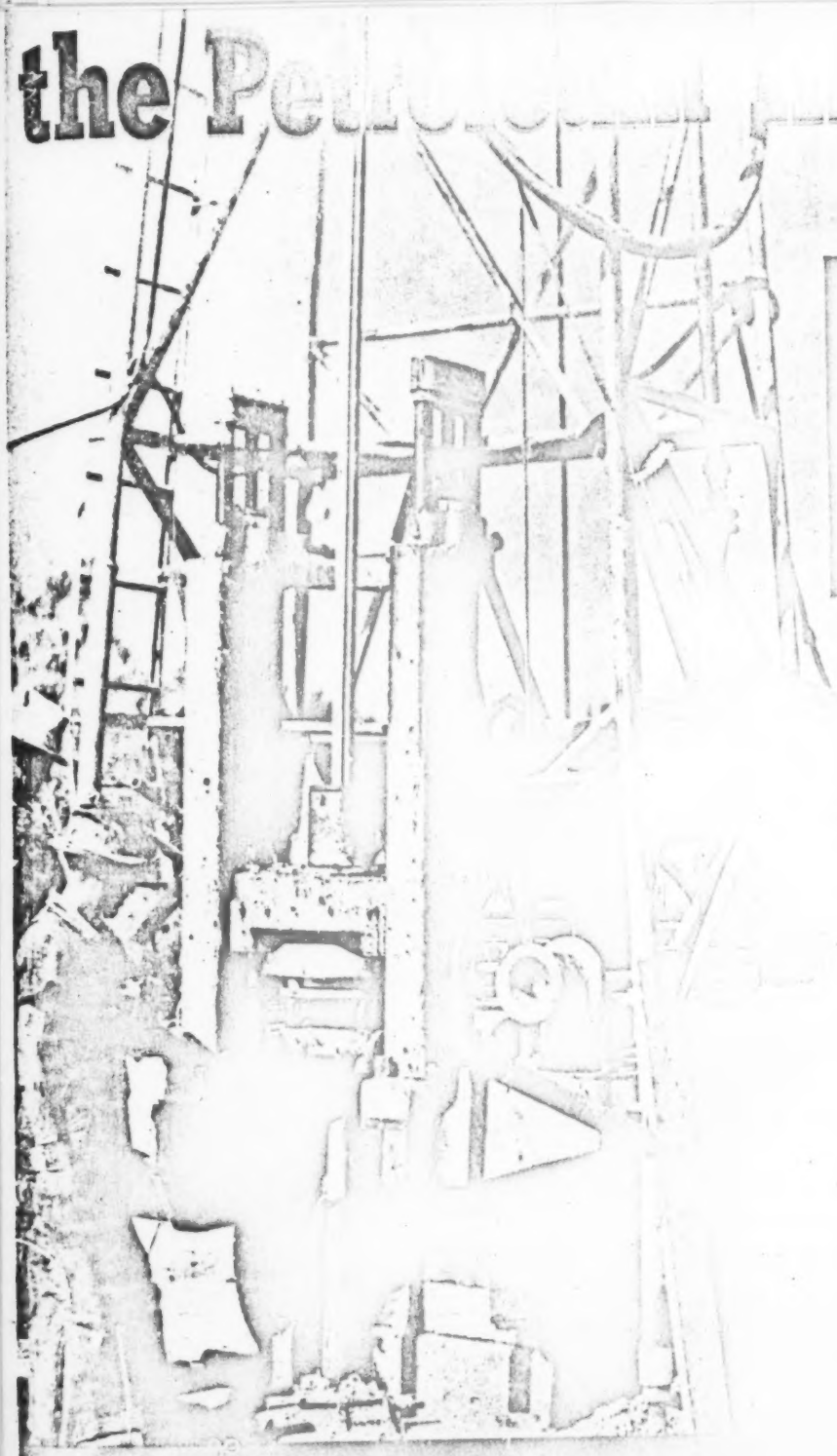
1932

the Petroleum Industry



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For lack of crude

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They will analyze your situation They will tell you whether any of your equipment can be converted to make war products—and how to do it.

All Universal processes and all Universal know-how are at the service of every refiner

Our only business now is war business

Call on U. O. P.

OIL IS AMMUNITION—USE IT WISELY CARE FOR YOUR CAR FOR YOUR COUNTRY

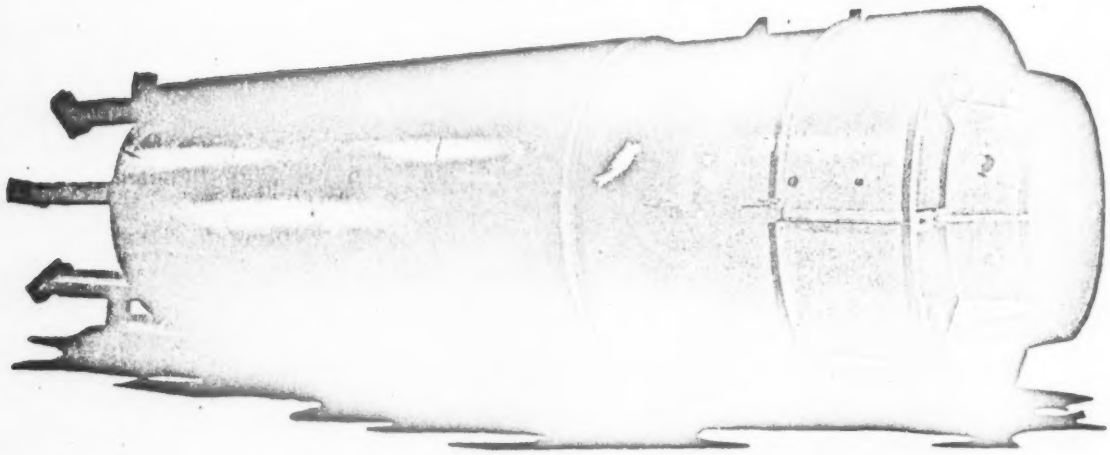
Universal Oil Products Co
Chicago 4, Illinois

Dubbs Cracking Process
Owner and Licensor

THE REFINERS INSTITUTE OF PETROLEUM TECHNOLOGY

PREFABRICATED

. . . READY FOR ERECTION WITH A MINIMUM OF LABOR



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*TRADE MARK REGISTERED. PATENTS ISSUED AND PENDING

PETRO-CHEM DEVELOPMENT CO.

50-55% YIELD

per pass of

ISO-BUTANE

by continuous

LIQUID PHASE ISOMERIZATION

New Liquid Phase processing supersedes Vapor Phase Isomerization as high-yield producer of Iso-butane.

ISO-PENTANE and ISO-HEXANE can also be produced.

- **Continuous Operation**
- **Decreased catalyst consumption**
- **Lowered capital investment**
- **Reduced operating costs**
- **Minimized steel requirements**

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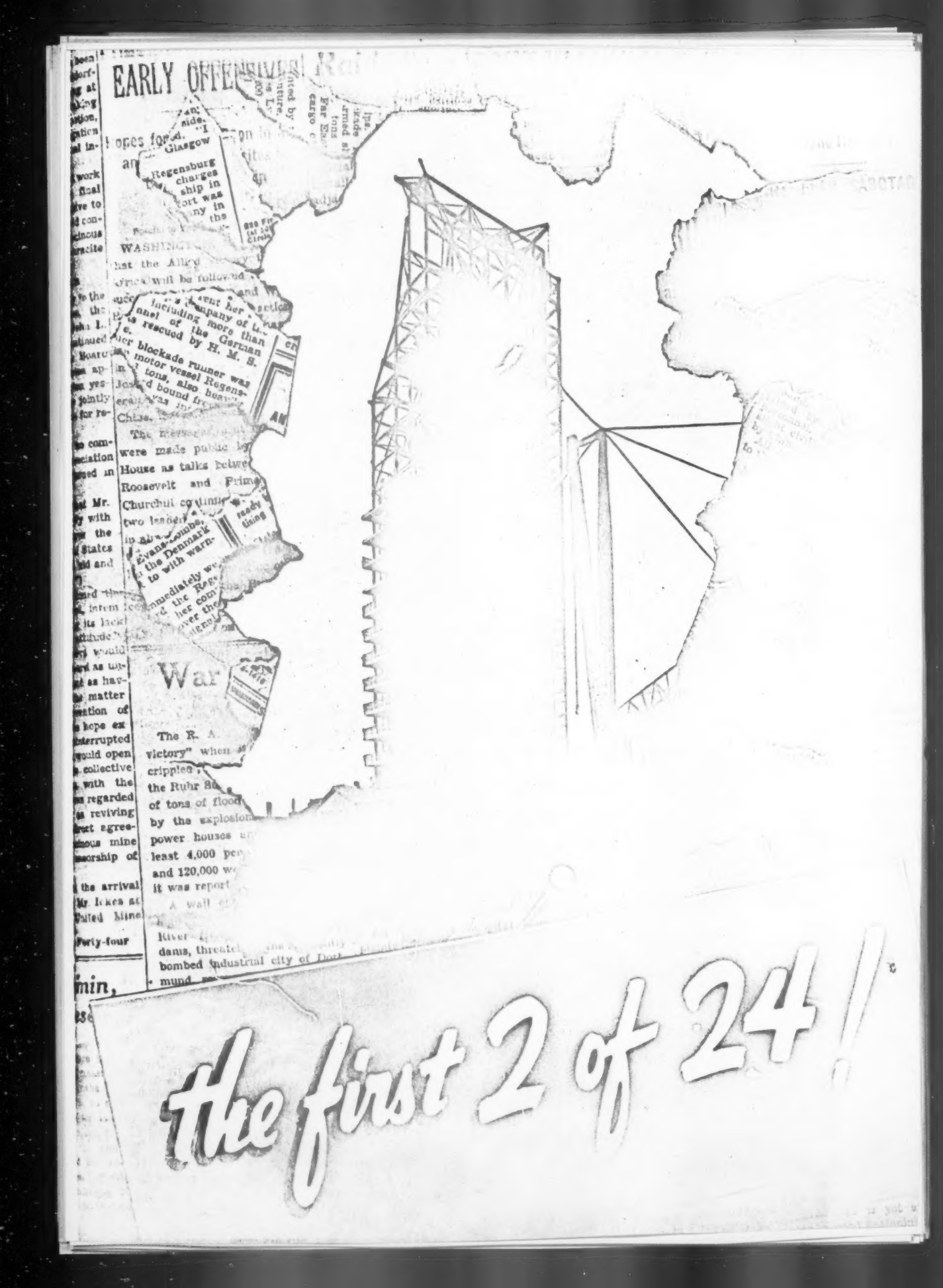
FOSTER WHEELER CORPORATION • 165 BROADWAY, NEW YORK, N. Y.

FOSTER WHEELER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the first 2 of 24!

24

UNITS

NOW

...STRUCT

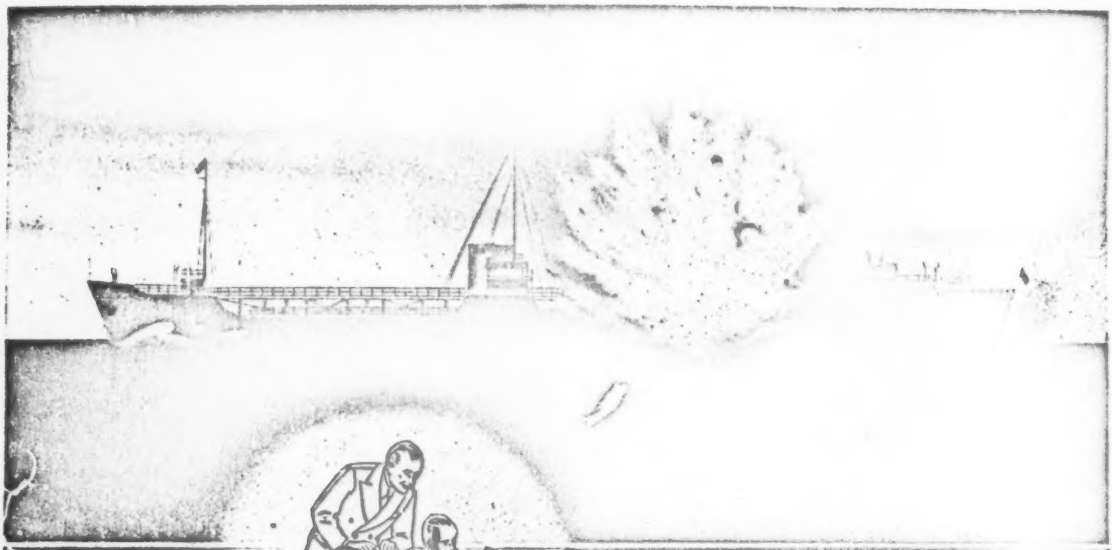
all designed and being built by LUMMUS

DESIGNED to produce motor fuels for all [illegible] strategic materials, participated in [illegible] the handling of cargoes [illegible] units designed and [illegible] important part of America's [illegible]

They will be a mighty [illegible] war program, too, for [illegible]

LUMMUS

PETROLEUM REFINING PLANTS



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Some construction, you mean! This is just one of many welded ships that have refused to be licked by torpedoes. Just like our welded M-4 tanks which withstood the Nazi 88's in North Africa. Ships, tanks, planes and guns—they're all welded for strength as well as for savings in time and materials.

Better products and *lower costs*—just what I want in my business after the war. Then why shouldn't I weld my peace-time products?

You should! You MUST if you plan to survive in the face of war-developed ideas. And believe me, your ship of business will sink or float, depending on how well you can stand up against competition on WELDING ECONOMY. Why not start NOW to learn from Lincoln the latest kinks in welding thrift.

THE LINCOLN

SOMASTIC

Permanent Pipe Protection

Preparing for river crossing

SOMASTIC-*coated pipe* is hauled and strung, roll welded, bent cold, lowered into the trench and backfilled by ordinary field methods without damage to the coating. The inherent permanence of SOMASTIC protection permits steel conservation by the use of lighter weight pipe, a timely consideration.

PORTABLE PLANTS
AVAILABLE EVERYWHERE

SOMASTIC
REG. U. S. PAT. OFF.
PIPE COATING

INDUSTRIAL ENGINEERING CO.

WILMINGTON, CALIFORNIA, Box 457 HOUSTON, TEXAS, Box 2091 BARTLESVILLE, OKLAHOMA, Box 149

AMERICA'S MECHANIZED MIGHT

DESTROYING OUR ENEMIES . . .

AMAZING OUR ALLIES

Here at Reed manufacturing techniques and skill, acquired through years of manufacturing oil tools for the fast changing oil industry, are being utilized in making valves and flanges for our cargo ships.

American mass production has always been an enigma to other peoples who have the population and the raw materials, but who do not have the formula for creating wealth. That formula is a function of our free enterprise system which provides the incentives and rewards that keep American industry producing at a pace no other system has ever approached.

PUT ALL YOUR SAVINGS IN WAR BONDS - EVERY PAY DAY FOR VICTORY!

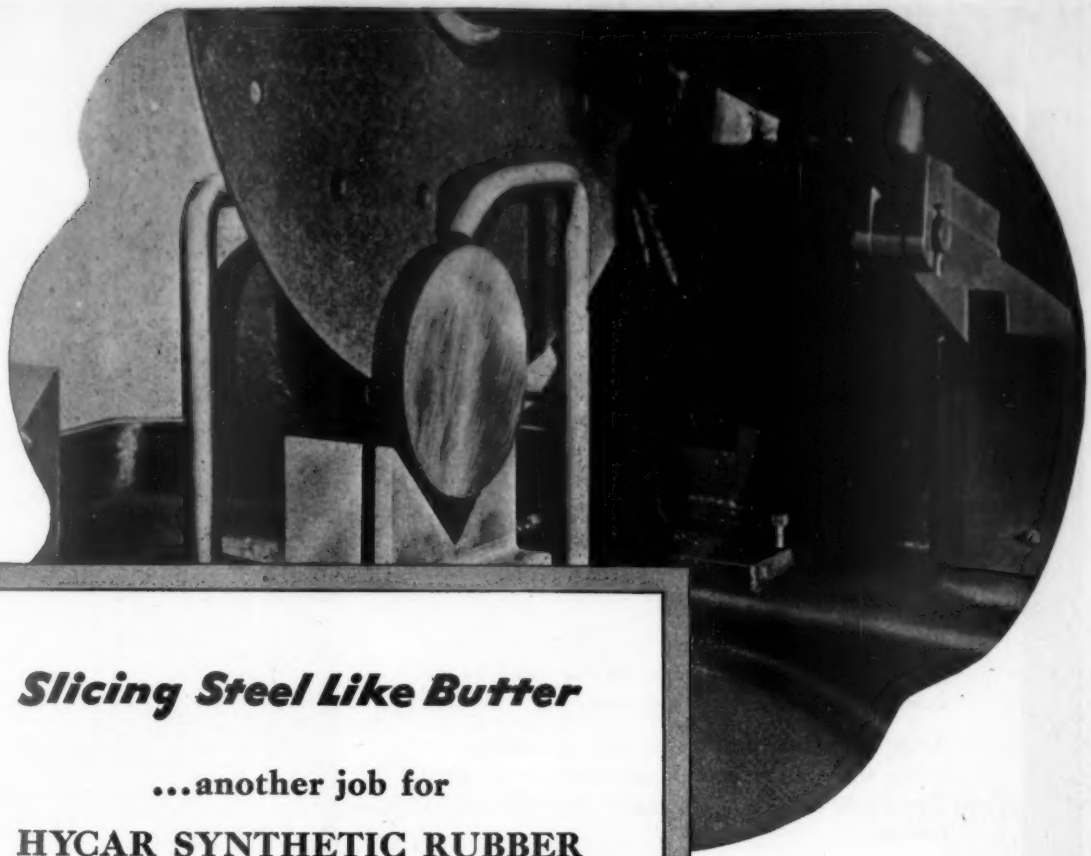
REED · ROLLER · BIT · COMPANY

HIS TARGET IS A STRUCTURE IN THE WILCOX!

The geophysical industry is waging total war, too. Specific objective is to maintain the already established favorable balance between oil supply and demand so that our fighters may never want for such war essentials as toluene for explosives, butadiene for synthetic rubber, and high octane aviation gasoline.

GENERAL'S skilled crews are in the thick of the fight. And when victory is won they will be even more capable of assisting you in planning your drilling program . . . geared to peacetime needs for petroleum.

General
GEOPHYSICAL COMPANY HOUSTON



Slicing Steel Like Butter

...another job for HYCAR SYNTHETIC RUBBER

HIGH-SPEED abrasive cut-off wheels that walk through heavy steel bars in a few seconds . . . this is not a place where you would expect to find synthetic rubber, but it's just one of thousands of ways Hycar has been used to improve essential products and processes throughout industry.

As the tough, durable bond that holds the particles of abrasive together in a cutting wheel, Hycar withstands the deteriorating effects of heat and oil-emulsion coolants, thus lessening wear and prolonging life of the wheel.

Resistance to oil—heat—abrasion . . . the qualities responsible for the superior performance of Hycar in this exacting service, are the identical qualities needed in many oil industry applications. Hose that withstands abrasion as well as oil; gaskets and seals that resist heat and compression-set; packers that retain their dimensional accuracy . . . these are just a few of the many ways Hycar is solving some of the oil industry's most persistent problems. For Hycar's wide usefulness lies in its ability to be tailor-made to fit the needs of each individual job. *Hycar Chemical Company, Akron, Ohio.*

Hycar is made in several types, supplied to fabricators in the form of crude synthetic rubber. We will be glad to work with you and your rubber products supplier in applying Hycar to your problems.

hycar

LARGEST INDEPENDENT PRODUCER OF BUTADIENE SYNTHETIC RUBBER IN AMERICA

Get the Most Out of the Wheels

On Your Portable Grinders

OF course the first thing is to make sure you have the right grain and grade of Norton Wheels for the types of grinding you are doing. But even when this has been done, improper handling can waste many grinding wheels.

Set the grinder down carefully each time—where it can't fall against anything. A cracked wheel may fly apart.

When you change wheels for a different size or shape don't loosen the one on the machine by banging it. Use a wrench or vise.

Keep the wheel free cutting and in balance by truing when necessary. If the speed is too slow the wheels are apt to get out of round and out of balance.

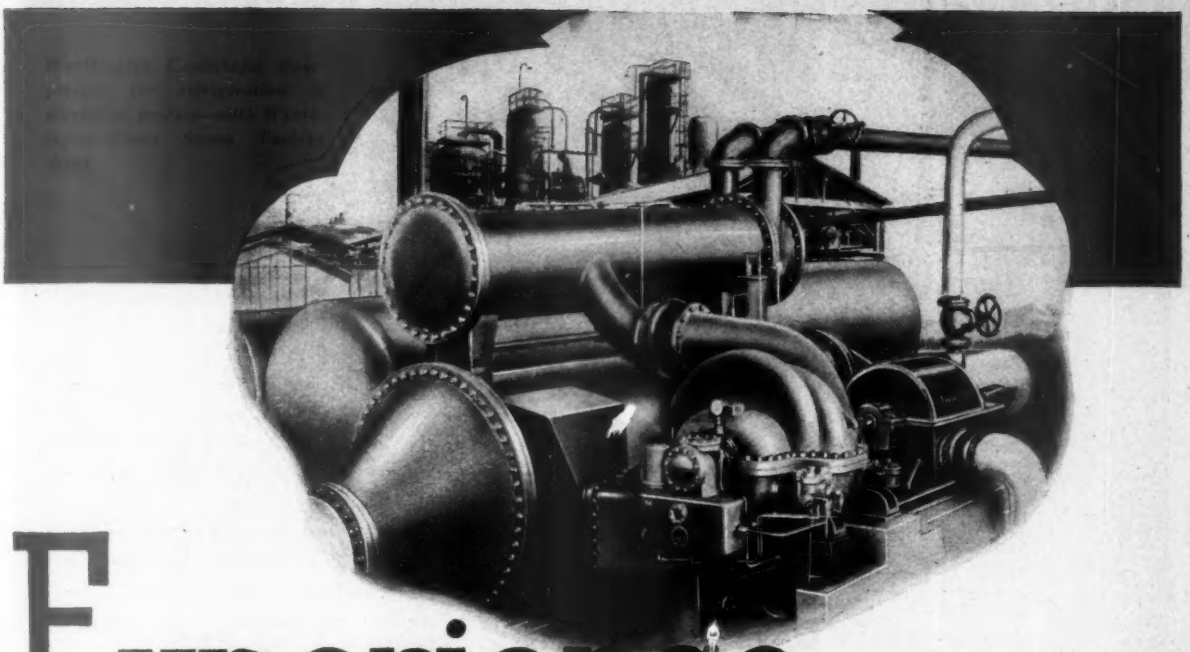
Use just enough pressure to keep the wheel cutting at its best rate and still not slow down or stall the grinder.

Don't hesitate to call in a Norton abrasive engineer. He'll be glad to study your grinding jobs and make sure you are using the most suitable wheels.

NORTON COMPANY, WORCESTER, MASS.

Distributors in All Principal Cities

W886



Experience

IN *Alkylation* TEMPERATURE CONTROL

WORTHINGTON CENTRIFUGAL REFRIGERATION, tailored to the particular requirements of heat control in the alkylation process, has substantial operating experience behind it—as well as design qualifications for engineering preference.

Machines in this service for over three years are testimony to the fundamental soundness of Worthington Centrifugal Refrigeration design. This equipment is especially engineered for this application.

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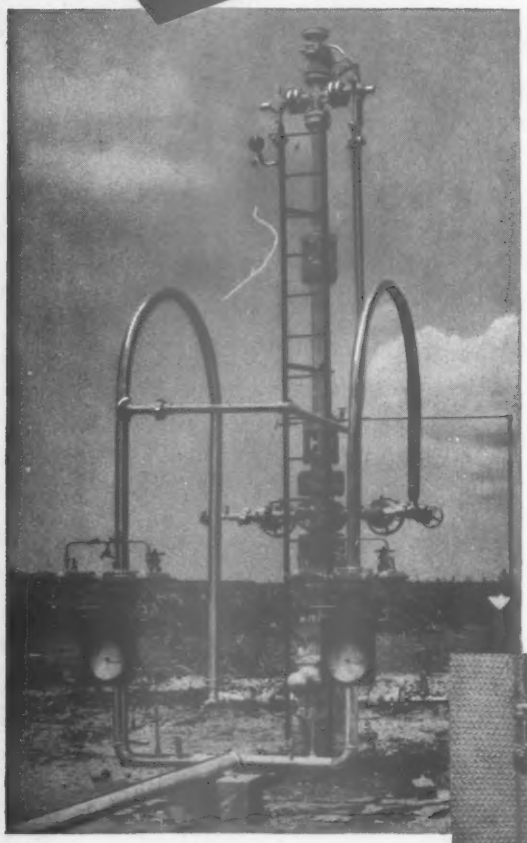
CA3-31

WORTHINGTON

Refrigeration

SIMPLIFICATION ★ A VICTORY AID!

All 9 Lives!



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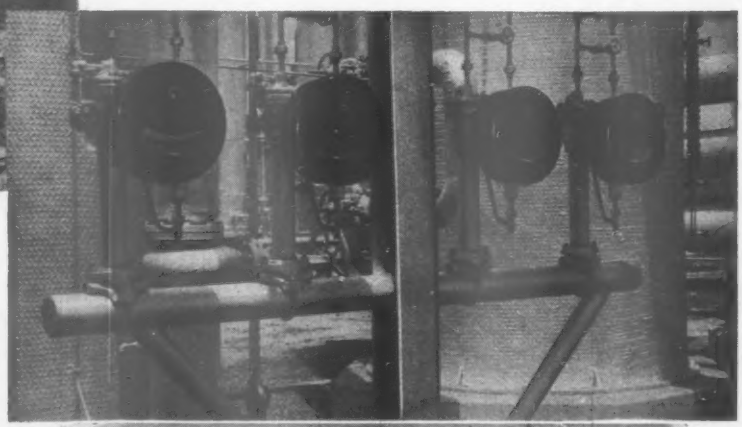

METRIC METAL WORKS • ERIE, PA.

AMERICAN METER COMPANY

INCORPORATED ESTABLISHED 1836

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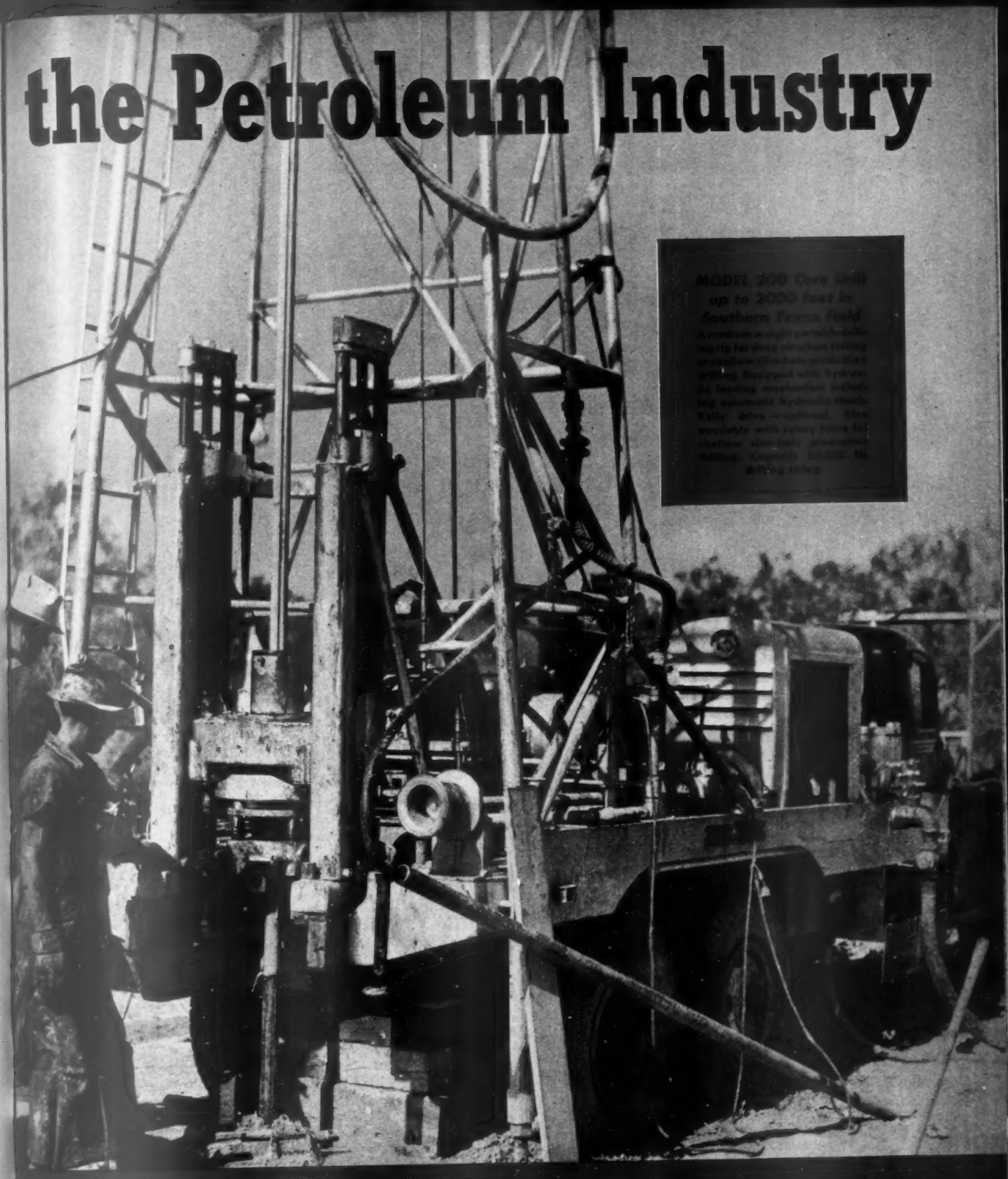
1932

the Petroleum Industry



SULLIVAN

A COMPLETE LINE OF OILFIELD EQUIPMENT

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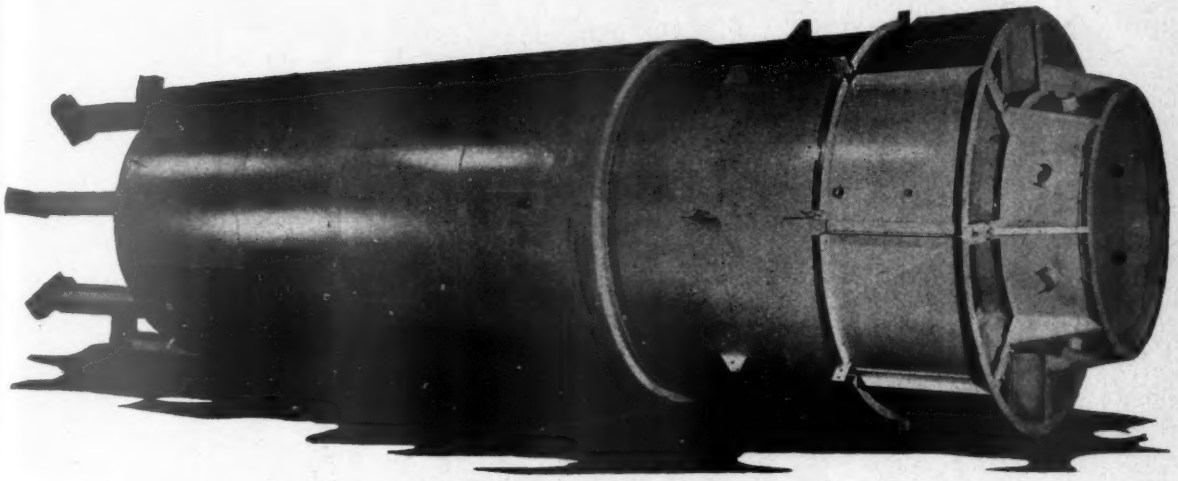

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PETRO-CHEM DEVELOPMENT CO., INC., 120 EAST 41st STREET, NEW YORK, N. Y.

Representatives: Bethlehem Supply Co., Tulsa, Houston, Los Angeles Faville-Levally Corp., Chicago.

50-55% YIELD per pass of...

ISO-BUTANE by continuous LIQUID PHASE ISOMERIZATION

New Liquid Phase processing supersedes Vapor Phase Isomerization as high-yield producer of Iso-butane.

ISO-PENTANE and ISO-HEXANE can also be produced.

- **Continuous Operation**
- **Decreased catalyst consumption**
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- **Reduced operating costs**
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FOSTER WHEELER CORPORATION • 165 BROADWAY, NEW YORK, N. Y.

FOSTER WHEELER

PRESIDENT EXPECTS
EARLY OFFENSIVES
Raids
eaux in Day Blo
MILES FROM ROME
North Africa Fly
Italian Capital in Foray
on Seaplane Hangars
Say Fliers Dropped Explosive
In City, as Well as Leaflets
War
first 2 of 24!

24 T.C.C. UNITS

NOW UNDER CONSTRUCTION

all designed and being built by LUMMUS

DESIGNED to produce more . . . and higher quality . . . source materials for 100 octane gasoline, requiring less strategic materials, particularly less alloy requirements in the handling of corrosive stocks . . . the twenty-four T.C.C.* units designed and now under construction by Lummus are an important part of America's 100 octane gasoline program.

They will be a mighty important factor in America's post-war program, too, for the Thermofor Catalytic Process with the new synthetic bead catalyst shows lowest cost of operation . . . improved performance beyond any catalytic operation known to date and high yields of post-war quality motor gasoline.

THE LUMMUS COMPANY • 420 Lexington Avenue, New York
2005 Michigan Ave., Chicago, Ill. • 6345 Spring St., Los Angeles, Calif.
Florida 671, Buenos Aires, Argentina
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T.C.C. — THE WAR-TIME PROCESS WITH THE PEACE-TIME PAY-OFF

*Licensed by Houdry Process Corporation

LUMMUS

PETROLEUM REFINING PLANTS

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THE LINCOLN ELECTRIC COMPANY, CLEVELAND, OHIO

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General
GEOPHYSICAL COMPANY GGC HOUSTON

Safe Ending SAVES STEEL TUBING

Get More Service from Your B&W Furnace Tubes During the Emergency When Maintenance Items Are Hard to Get

In many cases where "end-corrosion" necessitates removal of carbon or low chromium-molybdenum alloy steel tubes in furnace equipment, continued maintenance or a saving of critical alloying material may be effected by safe-ending with a short stub of carbon or alloy steel tubing. The body of the tube may be well above retirement thickness and, if in otherwise good condition, it can be salvaged for further use by cutting off, cleaning the ends—machining to a proper bevel for the welding groove—and fusion welding in the refiner's own pipe shop.

Information on methods of welding, pre-heat and post-heat treatment of welds, type of electrodes, etc., for various grades of tubing may be obtained from B&W technical department, which is prepared to furnish specific information on methods of salvaging tubes of any grade. Several refiners have already taken advantage of this means of extending tube life.

Many B&W center-welded, long-length tubes are in refinery heater service; as also are safe-ended tubes joining carbon steel or low alloy steel to higher alloy grades to combat severe corrosion occurring at tube ends. These have been used successfully for several years, indicating that welds made under suitable technique are reliable and safe for pressure service.

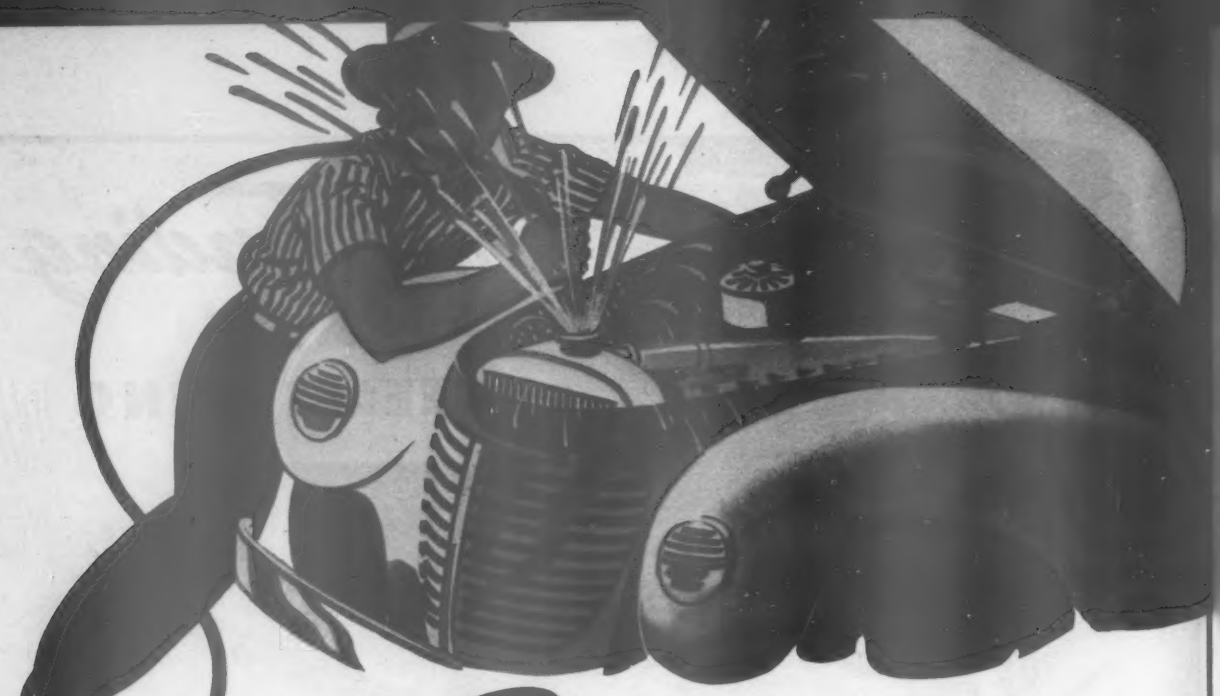
A simple annealing furnace such as this can be made from materials available in all refineries.

BABCOCK & WILCOX TUBES

HOT FINISHED COLD DRAWN ALLOY STEELS CARBON STEELS

THE BABCOCK & WILCOX TUBE COMPANY, BEAVER FALLS, PA.

TA-1251



Boilers, Too, Need Washing!

Just watch Henry scour "old Betsy's nose"! He's taking mighty good care of her these days, because he knows she must last him for the duration. And if he should bang up a fender—wow!

Boiler conservation pays, too. A clean boiler not only is an efficient boiler, but regular cleaning will extend boiler life materially. Cleaning tubes outside and inside prolongs their life. Once every eight hours all soot should be removed from tubes, smokebox, and tube sheet. Scale should be removed whenever it has become 1/16" in thickness. Wash scale out before it has time to harden, both above and below tubes.

Let the boiler cool thoroughly before emptying for washing. When the water has run out, open all manholes and handholes, and wash out immediately. When a man is in the boiler main steam valves should be closed and locked, the drain cock between the two main stop valves opened, and the feed water valve closed and locked. Check, and recheck safety measures before entering the boiler.

For top efficiency, boilers should be washed once each month. Always wash and clean thoroughly any boiler that is to be out of service for any length of time.

DISTRIBUTORS:

Lucey Products Corporation, Tulsa, Oklahoma
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Houston Oil Field Material Company, Inc., Houston, Texas
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Lucey Export Corporation, 3505 Woolworth Bldg., New York, N. Y.
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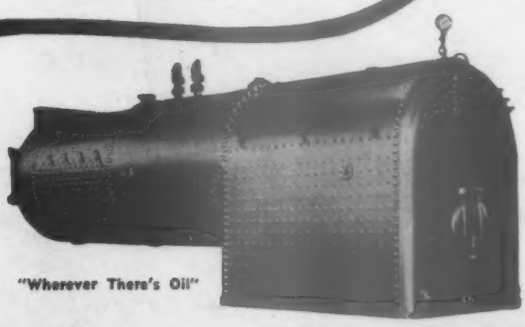

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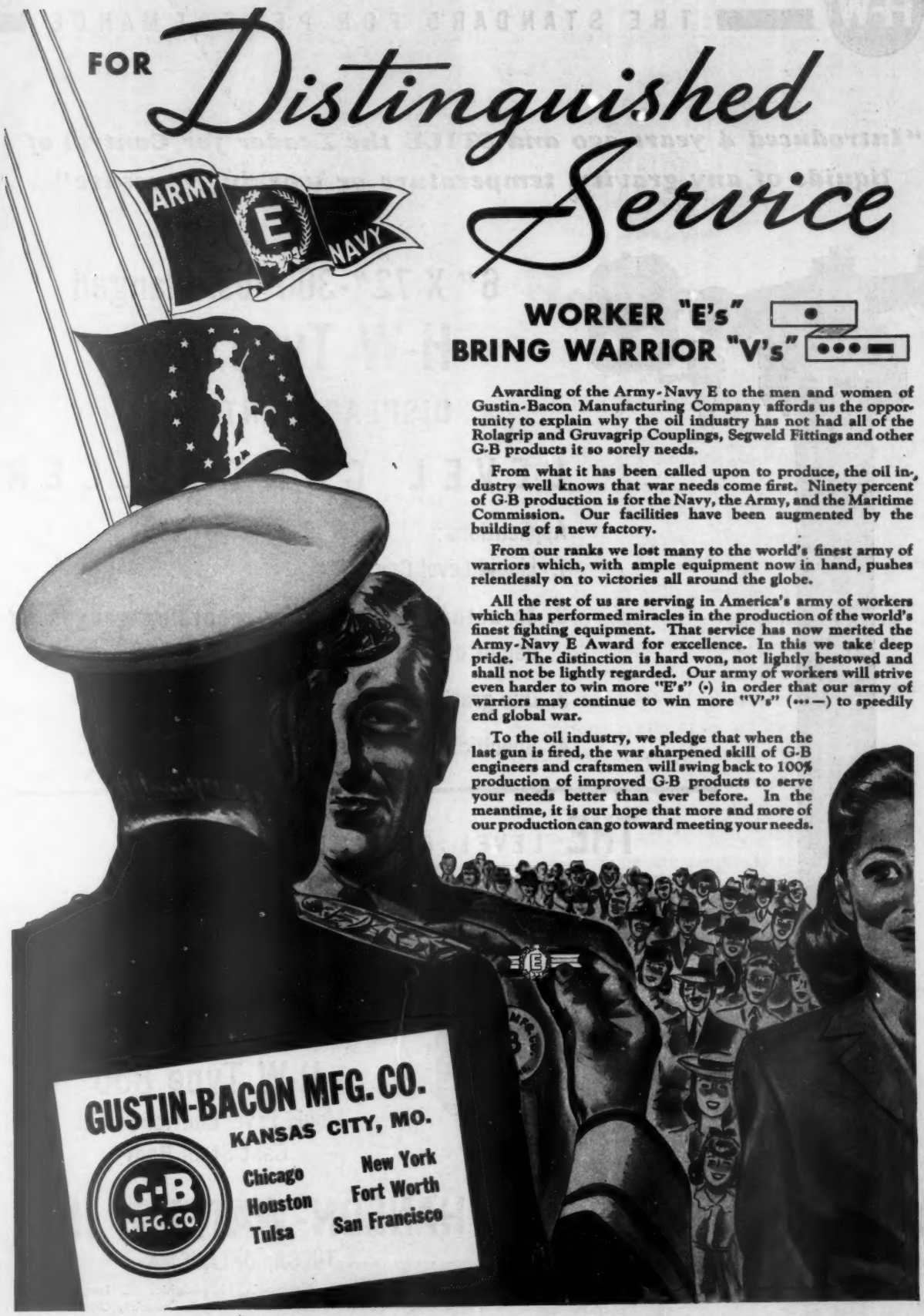
FOR *Distinguished Service*



WORKER "E's" BRING WARRIOR "V's"

Awarding of the Army-Navy E to the men and women of Gustin-Bacon Manufacturing Company affords us the opportunity to explain why the oil industry has not had all of the Rolagrip and Gruvagrip Couplings, Segweld Fittings and other G-B products it so sorely needs.

From what it has been called upon to produce, the oil industry well knows that war needs come first. Ninety percent of G-B production is for the Navy, the Army, and the Maritime Commission. Our facilities have been augmented by the building of a new factory.

From our ranks we lost many to the world's finest army of warriors which, with ample equipment now in hand, pushes relentlessly on to victories all around the globe.

All the rest of us are serving in America's army of workers which has performed miracles in the production of the world's finest fighting equipment. That service has now merited the Army-Navy E Award for excellence. In this we take deep pride. The distinction is hard won, not lightly bestowed and shall not be lightly regarded. Our army of workers will strive even harder to win more "E's" (·) in order that our army of warriors may continue to win more "V's" (···—) to speedily end global war.

To the oil industry, we pledge that when the last gun is fired, the war sharpened skill of G-B engineers and craftsmen will swing back to 100% production of improved G-B products to serve your needs better than ever before. In the meantime, it is our hope that more and more of our production can go toward meeting your needs.

GUSTIN-BACON MFG. CO.
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THE STANDARD FOR PERFORMANCE

"Introduced 4 years ago and STILL the Leader for Control of liquids of any gravity, temperature or working pressure"

6" X 72"-300 lbs. Flanged

H-W Type 850

DISPLACEMENT TYPE

LEVEL CONTROLLER

Applications:

1. Liquid Level Control
2. To actuate indicating or recording gauges for height of fluid level indication
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THE NO LEVEL CONTROLLER WITH
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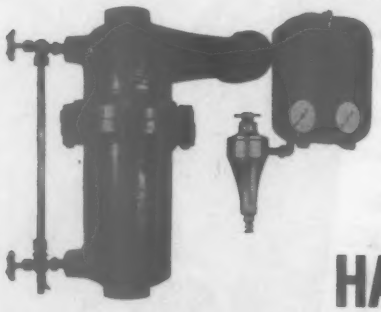


6" X 14"-150 lbs.

H-W Type 850

Liquid Level Controller with Cast Steel Body

HANLON-WATERS, INC.

TULSA, OKLAHOMA

New York, Chicago, Pittsburgh, Philadelphia, St. Louis, Denver Los Angeles, Shreveport, La.; Fort Worth, Houston, Corpus Christi and Odessa, Texas.

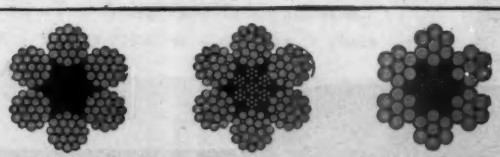
Rough on rope!

War lives on it, and civilians walk . . . while a hungry world probes for oil as never before. Last year within the United States, almost twenty thousand wells were started. And with many a driller, Rochester Ropes are a "must" specification.

No industry makes any more gruelling demands on wire rope. The steady strain of dead weight, the pull of the casing, the fishing for lost drills or twisted casing . . . the mud, sand, gravel, brine, damp, heat and cold at various levels . . . require rope built for tough going, stamina in every strand! And in the oil fields, as well as in the contractors' camps, steel mills, shipyards, mines, skyscrapers, plane plants, shipping . . . wherever the specifications are severe and requirements rigid, you'll find Rochester Ropes doing hard jobs well, safely, cheaply.

All our present output is restricted to government and high priority industries. But for the best in wire rope tomorrow, remember the name—Rochester!

ROCHESTER *Ropes*



Wire rope is precious now! Take proper care of what you have!

MISSION "ROLLING DOG" SLIPS

SAVE PIPE.. important all the time.. but vitally so in total war

MISSION ROLLING DOG PRINCIPLE assures full protection for your drill pipe because the rolling dogs give a gradual cushioning grip, instead of cutting or bottlenecking. Drill pipe is critical material. Save it.

Small non-continuous teeth further protect pipe by preventing undue stress concentration.

Faster Round Trips: The positive grip and instant release of these slips results from the action of the Rolling Dogs. This means faster, safer handling of pipe.

USE MISSION ROLLING DOG SLIPS AND PROTECT YOUR DRILL PIPE, CASING, AND TUBING.

You handle pipe faster and safer with Mission *"Rolling Dog"* Slips.

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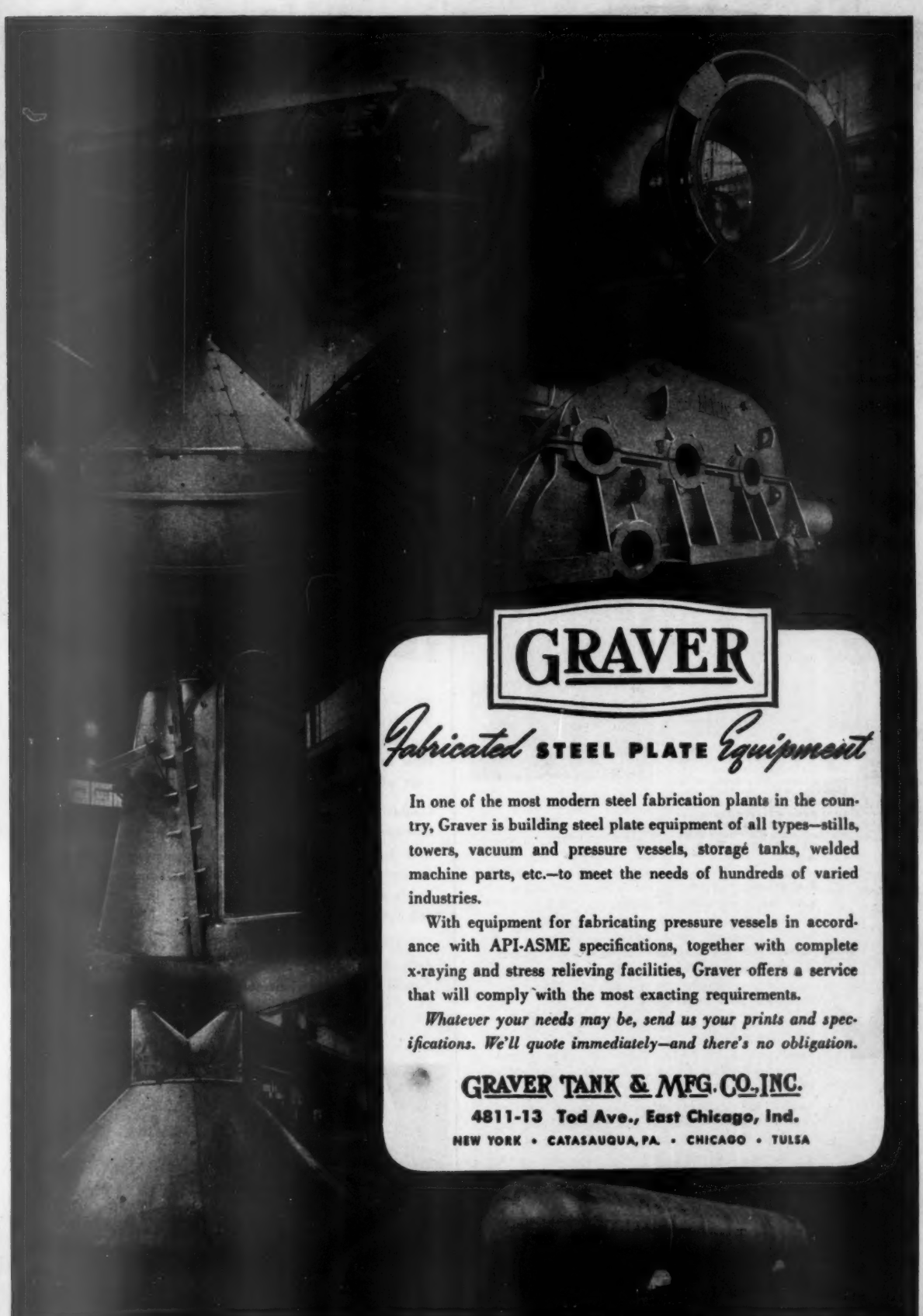
EXPORT OFFICE: 30 ROCKEFELLER PLAZA, NEW YORK



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Fabricated STEEL PLATE *Equipment*

In one of the most modern steel fabrication plants in the country, Graver is building steel plate equipment of all types—stills, towers, vacuum and pressure vessels, storage tanks, welded machine parts, etc.—to meet the needs of hundreds of varied industries.

With equipment for fabricating pressure vessels in accordance with API-ASME specifications, together with complete x-raying and stress relieving facilities, Graver offers a service that will comply with the most exacting requirements.

Whatever your needs may be, send us your prints and specifications. We'll quote immediately—and there's no obligation.

GRAVER TANK & MFG. CO., INC.

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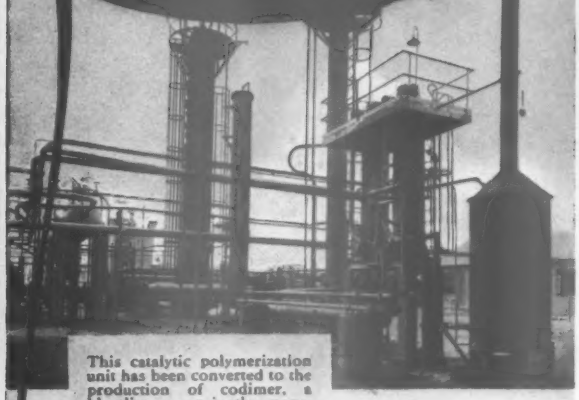
NEW YORK • CATASAUQUA, PA. • CHICAGO • TULSA

Converted "Poly" Unit Making Codimer uses Florite ☆



This catalytic polymerization unit has been converted to the production of codimer, a blending agent in the manufacture of 100-octane gasoline. Feed gases are supplied by the Dubbs cracking unit seen in the background. Photo courtesy of Universal Oil Products Company.

Under present stress for enlarged production, many companies that are not fully equipped to turn out aviation gasoline, have found that they can make components of such gasoline, after relatively easy modification of their existing plants. The manufacture of codimer in converted plants like the one here illustrated is a good example, their output being sent to special 100-octane plants for final processing.

Clean feed gases, kept free from moisture at low temperatures, are required; and the properties of FLORITE, as an adsorbent and drying agent for such use, are becoming well recognized.

FLORITE selectively adsorbs 4 to 20% of its weight in water and is regenerated by heating to 350°F. It is efficient and economical in dehydrating propane, butane, air, nitrogen, carbon dioxide, refrigeration compounds, and other fluids. Full data on request.

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FLORIDIN COMPANY, INC.

ADSORBENTS

178 Liberty St. Warren, Pa.

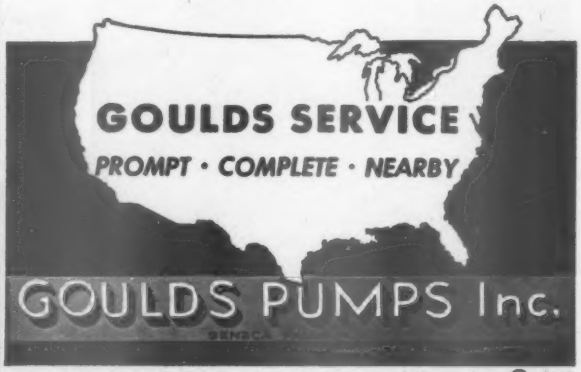
GOULDS PUMPS AT WORK PUMPING

LIQUID AMMUNITION

In this installation, and in many others in the petroleum industry, Goulds Pumps are operating the 'round-the-clock' war-time shift. In many cases, they are being pushed beyond their normal capacities—*doing four or five years of peace-time work in a single year.*

Goulds Pumps are meeting this war-time challenge for performance successfully, because the ability to operate over long periods in severe 24-hour-a-day service is one of their fundamental characteristics. It is built into the pump—a result of Goulds 95 years' experience in making pumps—and nothing but pumps.

There is a Goulds Pump—centrifugal or reciprocating—for every petroleum production, pipe line and refinery service. Benefit by the experience of scores of leading operators and install a GOULDS on that next job.



3947

Storage Tanks

Conservation in the Oil Industry . . .

TODAY'S task of conserving and protecting essential wartime volatiles is one of the duties of the petroleum industry. As dependable working partners in this important job, you'll find many storage tanks such as Hortonspheres, Hortonspheroids and tanks equipped with Wiggins Pontoon Roofs, Wiggins Breather Roofs and Wiggins Balloon Roofs. These vapor-saving units are based on theory that has been proven correct through years of practice.

Since they protect "fighting volatiles" from volumetric loss and product deterioration, these modern storage tanks have become today's key to conservation in the oil industry.

Above: WIGGINS PONTOON ROOFS are primarily recommended for use on working tanks. Of the six tanks shown, four have a capacity of 27,500 bbls. and two hold 55,000 bbls. They are located at a pipe-line terminal.

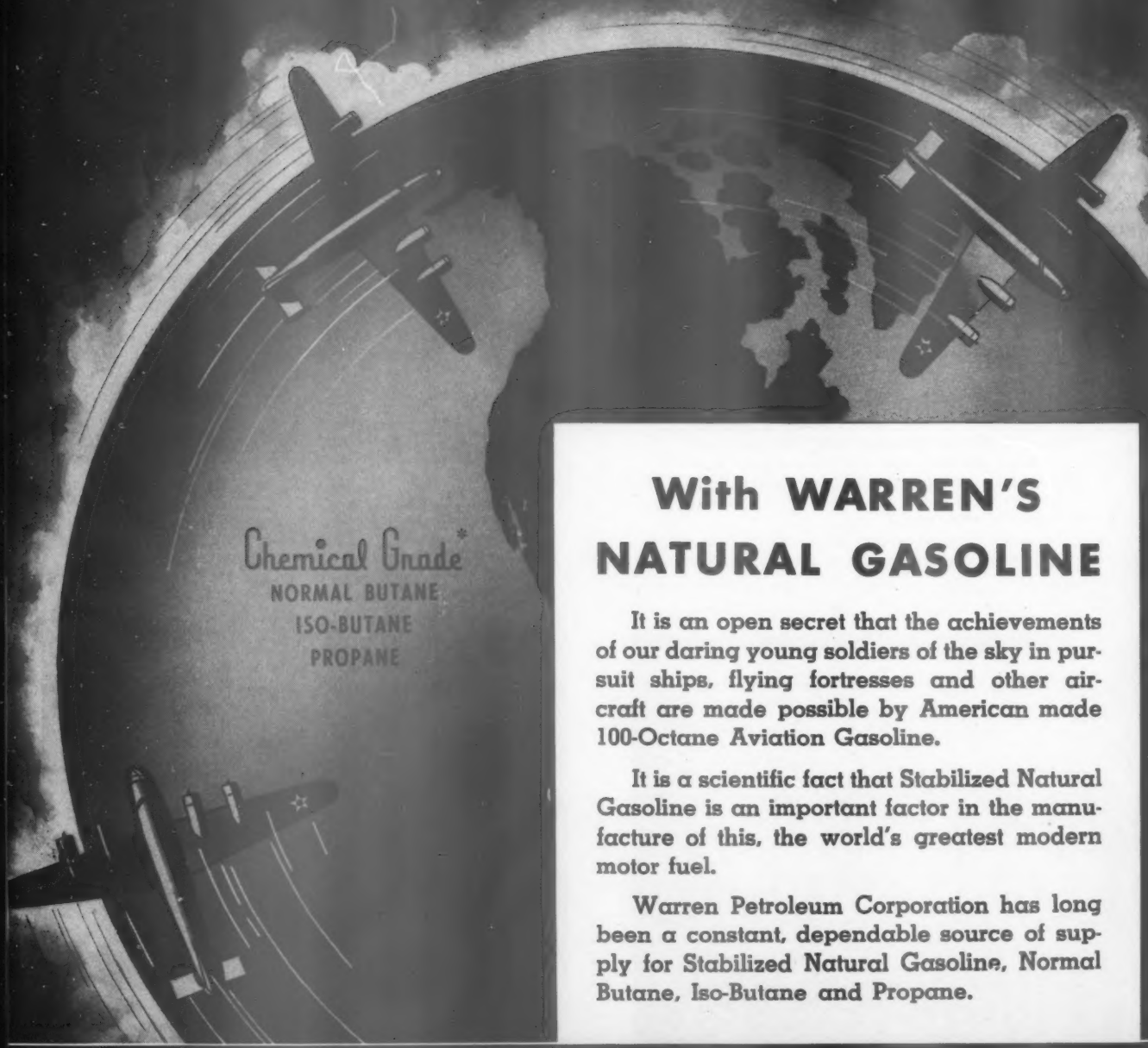
Below: WIGGINS BALLOON ROOFS are recommended for new or existing tanks that are filled or emptied not more than six times a year. The unit shown equipped with a Wiggins Balloon Roof has a capacity of 25,000 bbls. and is 73 ft. in diam. It is located at a refinery.

Above: WIGGINS BREATHER ROOF tank shown is located at a pipe line company and is used for the storage of crude oil. The tank has an 80,000-bbl. capacity.

& IRON COMPANY

NEW YORK - PHILADELPHIA - SAN FRANCISCO - TULSA - WASHINGTON

From Aleutians to Berlin and Coral sea



With WARREN'S NATURAL GASOLINE

It is an open secret that the achievements of our daring young soldiers of the sky in pursuit ships, flying fortresses and other aircraft are made possible by American made 100-Octane Aviation Gasoline.

It is a scientific fact that Stabilized Natural Gasoline is an important factor in the manufacture of this, the world's greatest modern motor fuel.

Warren Petroleum Corporation has long been a constant, dependable source of supply for Stabilized Natural Gasoline, Normal Butane, Iso-Butane and Propane.

WARREN PETROLEUM CORPORATION

Manufacturers, Exporters and Marketers of Natural Gasoline and Liquefied Petroleum Gas

Tulsa, Oklahoma

Export Terminals: Corpus Christi, Port Arthur and Norsworthy, Houston, Texas, Lake Charles, La., and Marcus Hook, Pa.

Speed··· Stamina
AND
Sustained
Accuracy

SMITH HIGH-PRESSURE METER MODEL M-65
929 bbls. per hour . . . working pressure 1000 p.s.i. Also available in sizes from 57 bbls. per hour and for 250 and 500 p.s.i.

***S**ustained accuracy*
—that's the vital consideration when choosing a petroleum meter. For petroleum meters measure *money!* A meter handling 929 barrels per hour of liquid costing approximately $2.00 per barrel, before tax — $44,592.00 in a 24-hour period.

That is why *sustained accuracy* is the focal point around which *all* Smith Meters are built. The simple, time-tested Smith Rotary Principle, and exclusive design, provide an unequalled combination of speed, stamina, and *sustained accuracy.*

SMITH METERS FOR EVERY PIPE LINE AND REFINERY NEED ARE AVAILABLE ON PRIORITY

SMITH METER COMPANY
SUBSIDIARY OF A. O. SMITH CORPORATION
Factories at Los Angeles and Milwaukee

here's how we can save the oil we're
LOSING
now

Guiberson
Type B-1 Oil Saver

Waste, always inefficient, is inexcusable in wartime — and that includes the oil that is usually lost while drilling in, working tubing and running rods. The GUIBERSON OIL SAVER is a **positive** and **performance-proved** means of preventing this waste, and turning the oil now lost into **profit.** See your Composite Catalog — or write for details.

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Now supplying critical materials to the Army, Navy, Marines and Army Air Forces

GUIBERSON
LIFE EXTENSION SERVICE FOR OIL WELLS

BETTER ELECTRIC SERVICE IS IN STORE FOR YOU!

WAR has made great demands on Utility Electric Power, a fact you know already. But during this time of concentrated effort we are anxious you know of the important development taking place within the ranks of your Utility Electric Power Companies. The war is giving them an invaluable experience—one that will definitely result in better Electric Power Service for YOU. So when the time comes to turn this tremendous force of power back to regular industry you will be amazed at the many new advantages in store for you. Watch for developments! Be ready to experience an improved Utility Electric Power Service!

Use Utility Electric Power!

PETROLEUM ELECTRIC POWER ASSOCIATION

Box 1406, Oklahoma City, Oklahoma

Classified Advertising

The Market Place for the Oil Industry

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WANTED MECHANICAL ENGINEER

With experience in design of oil well drilling and servicing equipment. Excellent opportunity for a man with creative ideas, ability and good personality. The person employed to fill this position will work under the Chief Engineer and will be responsible for all work in this field. Permanent position with major company located in the Southwest. State education, experience, age, draft status and other particulars, including recent photograph in first letter. Essential worker applicant must have war manpower commission certificate of availability. Box B-640, The Oil and Gas Journal, Tulsa, Okla.

MEN WANTED, by large independent oil company, for work on seismograph field crews engaged in exploration for oil in the United States. This is considered essential war work and will continue after the war. College degree in engineering or geology desirable. Address full particulars including education, age, experience, salary requirements, draft status to Box 96, Bakersfield, California.

• • • • WANTED • • • •

Major oil company with continent-wide operations and research seeks graduate technical men of the following qualifications:

MECHANICAL ENGINEERS—with petroleum refinery or similar experience. Should be familiar with refinery design, estimating, construction, mechanical equipment, engineering materials, and utilities systems. Process knowledge desired although not essential.

CHEMISTS AND CHEMICAL ENGINEERS interested in research, design, or plant operation. Should have training and experience in refinery or other industrial organizations.

Work not of a temporary nature. In reply state experience, education, age, marital status, draft classification and salary expected, include small snapshot (not returnable). Replies strictly confidential. Applicants now employed at highest skill in war industries not solicited. Box B-670, The Oil and Gas Journal, Tulsa, Okla.

OIL COMPANY desires party experienced in making maps and plats, also familiar with either Geological or Land Department work. Permanent position for right party. State references and experience fully. Box B-674, The Oil and Gas Journal, Tulsa, Okla.

WANTED—Mechanical engineer between 30 and 45 or man with suitable mechanical training equivalent as inspector for chemical plant equipment. Should be familiar with pressure vessels, pipe lines, pumps, storage tanks and similar equipment. Good opportunity for advancement. Rapidly expanding plant located in Detroit area manufacturing important war chemicals. Applicant must be qualified to accept responsibility. Also must qualify under WMCES. Write giving full details including education, work experience, references, and salary desired. Box B-673, The Oil and Gas Journal, Tulsa, Okla.

NOTICE TO ADVERTISERS

Advertisers offering positions to workers skilled in critical war industries are requested by the War Manpower Commission to include the following sentence in their advertisement:

"Applications from those now employed in war industries will not be considered."

HELP WANTED

HELP WANTED: Good salary and rapid advancement for capable and ambitious man, experienced in buying and selling oil and gas leases and royalties. Give record of experience, and references. Address Box B-672, The Oil and Gas Journal, Tulsa, Okla.

WANTED: Engineers and Laboratory Technicians, Ceramists, Chemists, Physicists, Petrographers, either men or women, must be draft exempt. Write giving experience. Stupakoff Ceramic and Mfg. Co., Latrobe, Penna.

SITUATIONS WANTED

SALESMAN: Wants connection with opportunity. Age 31, military exemption. Excellent character, good appearance. High school education. Experience as salesman, and oil and gas field superintendent. Good knowledge petroleum and gas industry United States and Canada. References. Write: Murray D. Rowe, 350 Bay Street, Toronto, Canada.

CABLE TOOL DRILLER: 23 years' experience, 42 years old, married, no children. Driller, toolpusher, contractor. Shut down own tools for duration to enter Army or Navy. Refused by both services for slight deafness in one ear. Pilot R.A.F. captain, in last war. Excellent physical condition. Can drill on any type machine or standard rig to any depth. Have had experience in Oklahoma, Texas, Kansas, Missouri, Wyoming, California, Indiana, Pennsylvania, New York, and the West Indies. Rotary driller in 1923-24. No rotary work since then. Will go anywhere but prefer wildcat job in Rocky Mountain district. Capable of drilling and/or running tools under any conditions. Member A.I.M.M.E. Can give many references. Now in California, can be reached through Box B-650, The Oil and Gas Journal, Tulsa, Okla.

LUBRICATING SALES EXECUTIVE or representative with a background of twenty-five years experience is seeking a change within the near future. Possess extensive knowledge of refining, application and sales of both paraffin and naphthenic oils. Not opposed to any location, however, acquaintance with tank car purchasers is largely confined to a wide midwestern area. Further details will be readily extended to interested parties. Address Box B-661, The Oil and Gas Journal, Tulsa, Okla.

ACCOUNTANT, experienced in public and private practice, age 40, married, 4H, now part owner and active in management of old established gasoline plant, desires additional accounting work for oil properties in Texas. Office in Fort Worth. Thoroughly conversant with Federal and State oil reports, tax requirements, and oil accounts. Would assume responsibility for complete operation and management of oil properties. Best references and good credit rating. Address Box B-663, The Oil and Gas Journal, Tulsa, Okla.

OIL ACCOUNTANT

Sixteen years with three major companies in pipeline, refining and marketing. Age 37. Draft class 3-A. Two dependents. Prefer Gulf Coast. Minimum salary $250.00 per month. Box B-671, The Oil and Gas Journal, Tulsa, Okla.

REFINERY TECHNICIAN—Chemical Engineer; Experienced superintendent, Chief Chemist, consultant; Process development and supervision; all phases refinery operation including waxes, asphalts, specialties; progressive, ambitious. Executive type position desired where past eighteen years experience can be used in management, direction, supervision, consulting, and advising capacities. Box B-656, The Oil and Gas Journal, Tulsa, Okla.

SITUATIONS WANTED

OIL STATISTICIAN
TAX ACCOUNTANT
EXECUTIVE

Now employed as Secretary-Treasurer, oil producing company. Desire change of my own volition. Familiar with Federal and States Taxes, including Income, Declared Value Excess Profit Taxes, all Governments and State reports pertaining to oil industry. Reorganizations under Federal Chandler Act, systems and accounting procedure, Production, Pipe Lines and Refinery branches, as well as Joint Interest ventures. Public Accounting experience. Desire permanent connection with substantial concern. Age 44, draft exempt. Post Office Box No. 2991, Dallas, Texas.

PETROLEUM and CHEMICAL ENGINEER, seventeen years experience, desires work as process engineer or chief chemist. Age 42 years. Dependents. Normal health. Box B-652, The Oil and Gas Journal, Tulsa, Okla.

ENGINEERING EXECUTIVE just beyond draft age with administrative, design and construction experience available. Address P.O. Box 2682, Dallas, Texas.

PERSONNEL AND SAFETY DIRECTOR, age 32, draft exempt, now employed but seeking change. Have had seven years experience in handling insurance and claims. Reference. Box B-677, The Oil and Gas Journal, Tulsa, Okla.

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OIL FIELD LEGAL BLANKS

Leases, assignments, releases, township plat books, well records, etc. Request on your letterhead gets free catalog. Olds Press, 215 East Third St., Tulsa, Okla.

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DELAWARE CHARTERS: Powers broad, taxes low. Many of the largest corporations have Delaware charters. Complete service $35. Submitted forms. Chas. G. Guyer, Inc., Wilmington, Delaware.

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NEW MEXICO
State Oil and Gas Leases

Forty acres and multiples thereof, in a new HoT spot, 23 oil companies own surrounding leases. Write for information. No obligation. HARRY S. WRIGHT, New Mexico State Lessee, Farmington, N. M.

FOR SALE—Oil and Gas Leases on structure, oil production, acreage for drilling contracts, also proven tracts of fluorspar. W. P. Harley, Bowling Green, Ky.

FOR LEASE: 100,000 untested acres in Tennessee Coal Basin. Part of Appalachian Oil and Gas field. Oil and Gas wells producing here at this time. G. E. Harrison, Crossville, Tennessee.

FOR SALE: Real Bargains! New 20 or 40 acre lease, hot play, near production, Shelby County; also 4,000 acre drilling block on structure. Write C. A. Parker, Box 451, Center, Texas.

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PRODUCING OR NONPRODUCING

Texas, New Mexico, Oklahoma, Louisiana and Illinois.

20 Years' Experience

Inquiries Invited.

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Complete stocks refining equipment, valves and fittings. Immediate delivery from our Tulsa Warehouse.

Refinery Equipment, Inc.

W. C. Berry
Union Ave. at 21st Street

Robert W. Duden
Tulsa, Oklahoma

FOR SALE: 300-13" OD, 8 thread, new casing couplings. 1—Gasoline Power Drilling Rig good for 3000'. Also Steam Drilling Rigs and pipe and casing of all sizes. We also purchase abandoned Leases, Refineries, pipe lines and other oil field equipment. If in need of material, or have material for sale, communicate with LOUISIANA IRON & SUPPLY CO., Shreveport, La., Phone 5223, or L.D. 1.

INGERSOLL-RAND air compressor 650 C.F.M. and one A.C. 75 K.W. generator set complete with switch board and exciter. 356 West North Street, Indianapolis, Ind.

FOR SALE: One type FC-OCS Reverse Clutch, complete with 56" 10 groove V-belt pulley. Melton Machinery & Supply Co., Seminole, Okla.

Second hand Oklahoma City alloyed sucker rods, ¾", ⅞" and 1".
Have sold millions of feet with satisfactory results. I recommend these rods up to 4000 ft.

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3—14,250 Gal. Cap. 9' x 30'
2—11,250 Gal. Cap. 8' x 30'
1—10,500 Gal. Cap. 10' x 17'
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FOR SALE: Slightly used—2-F-M 2-Cyl. Model 47—B.O. Diesel or gas engines, 1—7¼" x 14" G-D. Power Slush Pump. 3900 ft. 6⅝" Pittsburgh Special D.P. Hughes Joints. 1—Large 8" Emsco rotary rig with F-M Diesel power. Box B-646, The Oil and Gas Journal, Tulsa, Okla.

4000' GRADE D 3½" OD 13.30# range 2 internal flush external upset drill pipe equipped with Hydril tool joints; also, 5000' full hole 4½" OD 16.60# range 2 drill pipe. Chas. B. King, Panhandle Bldg., Wichita Falls, Texas.

1500 BBL. Skimming Plant complete with pumps, lines, fittings, instruments, bolted storage tanks. To be dismantled and removed by buyer. SOVEREIGN REFINING COMPANY, 777 No. Washington, Saginaw, Michigan.

FOR SALE: 3200' 8⅝" O.D. 36# J-55 Range 3—8 Rd. Thd. Seamless Casing, located Portland, Indiana. Same as new. Zanesville Tool & Supply Co., Zanesville, Ohio.

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3 ROTARY PUMPS

2—90 GPM Viking 3 HP, 3 Ph. 60 Cy. 220 V. Single Pumps.
100 GPM Blackmer 3 HP, 3 Ph. 60 Cy. 220 V. Double Pump.
PUMPS BOUGHT AND SOLD

L. M. STANHOPE
Wayne, Penna.

6000 ft.—4" Extra Heavy New Pipe plain ends

Duplex and Single Steam Pumps—several sizes

ARROW PETROLEUM CO.
7419 Franklin Street
FOREST PARK, ILL.

Used Engines and Compressors
We Rebuild and Guarantee

L. F. SMITH CO.
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OIL FIELD EQUIPMENT FOR SALE
by L. V. HULL
205 Panhandle Building
Wichita Falls, Texas

1—35 HP Reed Gas Engine; 1—18 ft. Band Wheel Reed Power; 1—13¼ x 6 x 10 Ingersoll-Rand Compressor; Galvanized Building for the above equipment. 1—250 Barrel Circulating Water Tank.

1—30 x 60 x 14' trussed, bolted steel building, 85% corrugated iron, good 15' louver in top of building; steel sash, steel doors. BARTLETT ELECTRIC CO., 115 N. Boston, Tulsa, Okla.

80,000 Bbl. Tank

All steel, cut down, rivets backed out and match marked. Ready for loading. Located Sunburst, Montana. Guaranteed A-1 condition in every respect.

Also 4—55,000 Bbl.

5 ring all steel tanks located in Okla. A-1 condition.

1—37,500 Bbl.

all-steel storage tank. Located El Dorado, Kansas. Offer as is, where is, or dismantled, match marked and loaded

REFINERY EQUIPMENT, INC.
Union Ave. at 21st St. Tulsa, Okla.

FOR SALE: 1—37½ HP FM Semi Diesel Single Cylinder Vertical Oil Engine, Type Y, Style V, Direct Connected to 25 KW 250 V DC Generator with Panel Board, as is, $1,250.00. Cities Service Oil Co., Patridge, Bartlesville, Okla.

1—Chicago-Pneumatic, 5¼ x 5, 65 Cubic Feet, Air Compressor mounted on Model A Ford Truck.
1—100 HP 200 lb. Pressure Kewanee Boiler.
3—110 HP 250 lb. Pressure Super-Heater Broderick Boilers.

Write
GREEN HEAD BIT & SUPPLY CO.
Box 4327 Oklahoma City 9, Okla.
for prices and further information.

FOR SALE

65,000' of 5" Standard line pipe—5⅛" outside diameter, weight 15# per foot.
Genuine wrought iron pipe, T&C, in excellent condition.
Pipe is now located at railroad siding near Bethlehem, Pennsylvania, ready for immediate shipment. Regular ceiling price for this wrought iron pipe same as for steel pipe.
For particular details, contact THE

PRODUCERS SUPPLY & TOOL COMPANY, Fort Worth, Texas, or THE INTERSTATE PIPE & SUPPLY COMPANY, Marietta, Ohio.

PAINT CLOSEOUTS
IMMEDIATE SHIPMENT

5,000 gallons Rust Inhibitive Paint (Color: Red) Government specification ES 680. Excellent for priming and coating all exposed steel equipment. Made to withstand weathering and chemical conditions.
Packed in 54 gallon drum . . . only $1.25 per gallon.
4,000 gallons Light Gray Navy Paint. Made with titanium and pure linseed oils, dries to a hard durable finish. This fine specified product purchased from the surplus of a Navy contractor.
Packed in 54 gallon drums . . .only $1.50 per gallon.
All prices quoted F.O.B. destination
100% MONEY-BACK GUARANTEE
Samples submitted upon request.

PAINT EXCHANGE OF CHICAGO
2256-74 Elston Ave. Chicago, Ill.

Classified Advertising

EQUIPMENT FOR SALE

FOR SALE: Practically new Webber 90 HP as oil or 50 HP as gas engine, heavy grooved fly wheel for (C) V-belts for driving generator. Bernice C. Yount, Ottawa, Kansas.

FOR SALE—72 Beaird Steel Headers, 4" I.D., 2000 lbs. test press.; 30 Brewster Steel Headers, 4" I.D., 3000 lbs. test press.; 30 B.W.Y. C.R. Steel Headers, 4" I.D., High Pressure. ARROW PETROLEUM CO., Centralia, Ill.

FOR SALE: One Model 45 Heavy Duty Star Spudder, mounted on rubber, 110 HP Waukesha power unit. One K-Type Star Spudder, Allis-Chalmers power unit. Sell with or without tools and lines. Box 378, Cherryvale, Kansas.

FOR SALE: 3 Complete Power Rotary Drilling Rigs with approximately 7000 feet 3½" OD Drill Pipe and 12,000 feet of 4½" OD Drill Pipe. All Waukesha, Butane equipped Motors and Gardner-Denver 14 pumps. These rigs are all running and in good condition. Box 331, Carmi, Illinois.

FOR SALE: Steel Building near Crane, Texas. Standard Butler building with steel framework, size 36' x 140' x 10'. Eleven revolving-type ventilators, twenty-six windows, six doors. Cities Service Oil Company (Pennsylvania), Houston, Texas.

1—60 HP HRT Boiler
1—200 HP Water Tube Boiler
All Sizes Oil Country Boilers
25,000 Feet New 4" OD 14 Gauge
Buttweld Steel Tubing
LUCEY PRODUCTS CORPORATION
Tulsa, Oklahoma

FOR SALE: One Cardwell R. L. Drawworks with spudder attachment, two 6" drill collars, 4½" kelly, core barrel, traveling block, hook, swivel, steel doghouse, light plant, and all necessary tools for rotary rig including 92' steel mast, also one 76 all steel Star Spudder mounted on mud boat. Equipment at Salem. HARVEY H. SIMS DRILLING CO., Box 180, Salem, Illinois.

FOR SALE: Complete Rotary Rig powered with 2—325 HP LRO Waukesha Engines, 1805 Gumbo Buster Drawworks, 7¾" x 16" Gardner-Denver Power Pump, 4500'—5⅛" FH Drill Pipe, 122' Angle Iron Derrick with bottom, with all necessary equipment to move on location. Price on application. RIGGS & HERBEL, 407 Union Nat'l Bank Bldg., Wichita, Kansas or Box 433, Chase, Kansas.

MUD HOG on skids—powered by Cadillac gasoline engine. Union tool duplex pump—6¼" by 12" stroke. Specially built for heavy duty. J. T. Mohar, 340 E. Pleasant St., Long Beach, Calif.

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ONE MILLION POUNDS

3" Standard Black, Buttweld Pipe, a new, first quality grade; approx. 30% in lengths of 42" to 72"; approx. 70% in lengths of 6' to 13'. Real "blue ribbon" material throughout, free of any rust or pit marks. Also several thousand new, railroad fittings, consisting of flanges, etc. Available for immediate shipment. Will sell all or any part.

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National Stock Yards
St. Clair Co., Illinois

EQUIPMENT WANTED

WANTED: Low power binocular microscope, preferably Spencer make, suitable for examination of oil well cuttings. Give full details first letter including make, model, condition, range of power, and price. Cosden Petroleum Corp. Att'n.: Mr. C. F. Barnes, Geologist, P. O. Box 1311, Big Spring, Texas.

EQUIPMENT WANTED

WANTED

Used storage tanks:
Pressure Tanks:
All sizes
Send us your list.

SONKEN-GALAMBA CORP.
108 N. 2nd St., Kansas City, Kansas

DIESEL ENGINES WANTED

1500 HP in one or more units with or without Generators. Single unit preferred. Give full information. Box B-418, The Oil and Gas Journal, Tulsa, Okla.

WANTED

Used Internal Combustion Engine Powered Mechanical Rotary Drilling Rigs.

LUCEY PRODUCTS CORPORATION
Tulsa, Okla.

DESIRE power rig complete with all accessories. Capable of handling 5000' of 4½" drill pipe with pump which will deliver 275 gal. per min. at 400 p.s.i. pressure. Box B-676, The Oil and Gas Journal, Tulsa, Okla.

AIR or gas compressor, horizontal type, 7x7 or 8x8 double acting, belt driven. Chas. B. King, Panhandle Bldg., Wichita Falls, Texas.

WANTED

Used Structural Steel
Pipe — Valves
Fittings
Send us your list

SONKEN-GALAMBA CORP.
108 N. 2nd St., Kansas City, Kansas

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FOR SALE: PRODUCTION AND EQUIPMENT

50 wells, average depth 1700 feet. Present daily production slightly more than 25 barrels 36 gravity oil. Most wells produce no water. Production can be increased by cleaning out. Also 10 presently dead wells which can be cleaned out and put back on production. Two deeper oil bearing formations within 800 feet. Leases cover 850 acres. Boundaries less than three-fourths drilled. Only two inside wells drilled to balance power. No dry holes. Also 6000 acres block with one producing well on it adjoining above production. Price: Pay us ceiling prices for equipment all in good condition, and we will give you the production which is still good for minimum net return of $500.00 per month during next ten years at present price. Owner retiring under doctor's orders. Don't write come and see. Alexander Boynton, 615 Insurance Bldg., San Antonio, Texas.

WANTED

COMPLETE Plants, Pipe-Lines, and Industrial Enterprises bought for cash or liquidated for the owners. Wire, phone, or write—INDUSTRIAL SUPPLY & EQUIPMENT CO., INC., 1044 Canal Bldg., New Orleans, La.—MA 5586.

SUBSTANTIAL work wanted for semi-portable rotary rig to 3000' anywhere on cash basis. Box B-675, The Oil and Gas Journal, Tulsa, Okla.

FOR SALE—MAPS

SO. GEORGIA MAPS
Where Majors are leasing.
McINTOSH BROS. or
C. W. DEMING, WAYCROSS, GA.

Crude-Oil Prices

Representative selected crude prices from all sections of the country appear below:

East Texas	$1.35
Conroe	1.43
Tepetate, Louisiana	1.18
Illinois basin	1.37
Pecos County, Texas	.95
Bradford, Pennsylvania	3.00
Van, Van Zandt County, Texas*	1.08

*No change since 5-21-41.

Gravity Schedules

Top prices include all gravities above grades designated, and low prices include all gravities below grades designated:

Gravity—	Signal Hill, Calif.	Oklahoma, Kansas	Gulf Coast Texas	West Texas*
18-18.9	$0.80	...	...	...
19-19.9	.84	...	$1.06	$0.70
20-20.9	.88	$0.85	1.08	.72
21-21.9	.92	.87	1.10	.74
22-22.9	.96	.89	1.12	.76
23-23.9	1.00	.91	1.14	.78
24-24.9	1.03	.93	1.16	.80
25-25.9	1.07	.95	1.18	.82
26-26.9	1.11	.97	1.20	.84
27-27.9	1.15	.99	1.22	.86
28-28.9	1.18	1.01	1.24	.88
29-29.9	1.20	1.03	1.26	.90
30-30.9	1.23	1.05	1.28	.92
31-31.9	....	1.07	1.30	.94
32-32.9	....	1.09	1.32	.96
33-33.9	....	1.11	1.34	.98
34-34.9	....	1.13	1.36	1.00
35-35.9	....	1.15	1.38	1.02
36-36.9	....	1.17	1.40	1.04
37-37.9	....	1.19	1.42	1.06
38-38.9	....	1.21	1.44	1.08
39-39.9	....	1.23	1.46	1.10
40 and above	....	1.25	1.48	1.12

*Includes Lea County, New Mexico.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, District Land Office, Las Cruces, New Mexico. Notice is hereby given that the S½ NW¼ sec. 9, T. 22 S., R. 37 E., N.M.P.M., New Mexico, 80 acres of land in the Penrose-Hardy oil and gas field, is offered as one parcel to the responsible qualified bidder of the highest bonus per acre for lease under section 17 of the act of February 25, 1920 (41 Stat. 437), as amended, at the royalty rate scale in the lease form in General Land Office Circular 1386, at a sale to be held in the district land office at Las Cruces, New Mexico, at 10 o'clock a.m. on July 28, 1943. The successful bidder must deposit on the date of the sale a certified check on a solvent bank, or cash, for one-fifth of the amount of his bid, and file a showing of qualifications to receive the lease as required by section 7 of Circular 1386. The remaining four-fifths, together with the annual rental in advance at the rate of $1 per acre, must be paid and a $5,000 corporate surety bond must be furnished prior to the issuance of the lease. The bidders are warned against violation of the provisions of section 59 of the United States Criminal Code, approved March 4, 1909, prohibiting unlawful combination or intimidation of bidders. The right is reserved to reject any and all bids at the discretion of the Secretary of the Interior. **Register.**

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CALENDAR

June.

PENNSYLVANIA GRADE CRUDE OIL ASSOCIATION, twentieth annual meeting, Pittsburgh, Pa., June 25.

INTERSTATE OIL COMPACT COMMISSION, summer quarterly meeting, William Penn Hotel, Pittsburgh, Pa., June 25-26.

AMERICAN SOCIETY FOR TESTING MATERIALS, annual meeting, Hotel William Penn, Pittsburgh, Pa., June 28 to July 2.

July

PETROLEUM INDUSTRY WAR COUNCIL, regular meeting, Washington, D. C., July 14.

KENTUCKY OIL AND GAS ASSOCIATION, annual midyear meeting, Ashland, Ky., July 24.

September

AMERICAN CHEMICAL SOCIETY, petroleum division, fall meeting, September 6-10. Place of meeting not yet determined.

October

AMERICAN GAS ASSOCIATION, twenty-fifth annual meeting, Jefferson Hotel, St. Louis, Mo., October 11-13.

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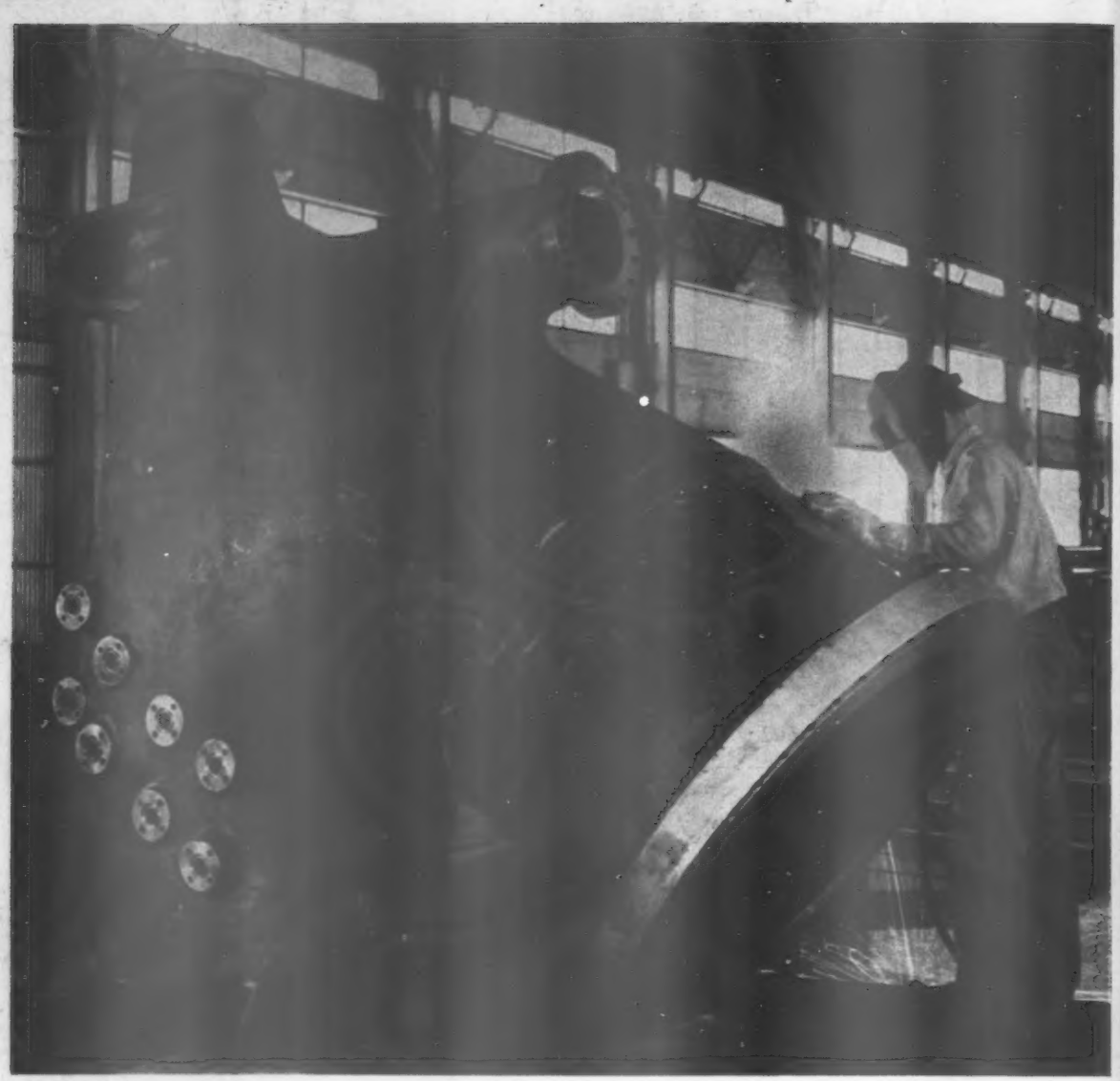

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